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Received 6-24-94
by V. Janosik, RPM

Mr. Victor J. Janosik (3 HW 24)
Environmental Protection Agency
Superfund Remedial Branch
Hazardous Waste Management Division
841 Chestnut Building
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Re: Comments Regarding U.S. EPA Region III Response to
PRPs' Post ROD Submittals

Dear Mr. Janosik:

At the request of the Order Respondents, Barr Engineering Company has reviewed the April 21, 1994 Thomas Voltaggio memorandum to Peter Kostmayer, the U.S. EPA Region III Response to PRPs' Post ROD Submittals Concerning Remedial Action at the Douglassville Disposal Superfund Site and the referenced U.S. EPA memoranda. Our comments regarding the Region III Response and its supporting documents are summarized in this letter and various attachments to this letter.

Our comments have been organized around the U.S. EPA's responses to issues raised by the PRPs in various submittals and meetings with Region III staff. As appropriate, we have subdivided certain U.S. EPA responses for discussion purposes. This was necessitated by the U.S. EPA's general failure to respond directly to many issues. An overview of our review comments is provided below. This is followed by an issue-by-issue discussion of U.S. EPA responses. Finally, a summary of the errors, omissions, misrepresentations, and other deficiencies related to the U.S. EPA's evaluation of the PRPs' submittals is provided. References cited throughout this document are listed after the signature page.

OVERVIEW

In general, the U.S. EPA has performed a perfunctory analysis of the PRP submittals and issues. The U.S. EPA does not specifically dispute that the RI dramatically underestimated the concentration of lead and precursors to dioxins and furans. However, instead of discussing the significance of these errors and their impact on meeting the goals and objectives of the NCP, the U.S. EPA simply concludes that the RI data supports the U.S. EPA's determination that a response action is necessary. The necessity of some kind of response action is not in dispute. At issue is whether the RI data and the U.S. EPA's presentation of that data reasonably informed the public as to the human health impacts of the operation of an on-site incinerator. This is of special importance given the documented evidence that hundreds of children in Berks County are already affected by lead poisoning. U.S. EPA did not properly inform the public of health issues related to on-site incineration because it has repeatedly underestimated the average concentration of lead in Source Area 2 materials. In 1988, the RI estimated the average lead concentration of Source Area 2 materials to be 367 ppm. The 1993 Final Design Analysis estimated the average lead concentration of the incinerator feed to be 4,072 ppm. Under U.S. EPA's own risk assessment guidance, a current estimate of an upper level average lead concentration for the incinerator feed would be 8,092 ppm (see attached letter from Doug Hawkins). U.S. EPA's failure to acknowledge that the public was inadequately informed by the 1988 RI/FS and the related 1989 ROD, is inconsistent with U.S. EPA's policy of maintaining the "highest level of public confidence" with regard to the reliability of hazardous waste combustion facilities (see attached May 4, 1994 Memorandum from E.P. Laws, Assistant Administrator, U.S. EPA).

The U.S. EPA has failed to discharge its responsibility to fully inform the public of the health issues related to the operation of an on-site incinerator. The U.S. EPA's assessment of health-related issues to on-site incineration glosses over major deficiencies; is inconsistent with U.S. EPA guidance, research, and previous experience; and is replete with assumptions which underestimate the hazards to public health. The U.S. EPA consistently underestimates the concentration of lead in the incinerator feed and the partitioning of lead to flue gas emissions; overestimates the efficiency of air pollution controls to remove lead; and ignores the significance of down wash in estimating ambient concentrations of lead. The U.S. EPA also fails to consider the existing background concentration of lead in air in evaluating compliance with the National Ambient Air Quality Standard (NAAQS). Taken together, these circumstances make the U.S. EPA's demonstration of compliance with the lead NAAQS a sham. Further, the U.S. EPA fails to acknowledge the existence and potential relevance of the new proposed NAAQS for lead in evaluating the impacts of incinerator emissions. The U.S. EPA wrongfully implies that the direct exposure risk assessment demonstrates compliance with the BIF health-based standards for lead emissions. The U.S. EPA ignores its own research which demonstrated that dioxins can form during the combustion of waste with chlorine concentrations even less than those measured in the Douglassville waste. In general, the U.S. EPA's assessment of the short-term impacts of an on-site incinerator is incomplete and inconsistent with the NCP goals of protection of human health and the environment.

The U.S. EPA has been arbitrary and capricious in its evaluation of the stabilization/solidification (S/S) technology that was screened out during the Feasibility Study and the S/S remedy that has been proposed by the PRPs. The U.S. EPA has provided inconsistent and unsupported justification for screening out S/S technologies and has not conducted a serious evaluation of the proposed S/S remedy or any other comprehensive S/S remedy. This is particularly disturbing in light of the U.S. EPA's refusal to acknowledge the true lead content of the waste and the U.S. EPA's own evaluation of baseline risks posed by Source Area 2. It appears that the U.S. EPA is not relying on a consistent and defensible rationale for rejecting the S/S remedy and is, instead, relying on an informal policy that has been adopted regarding the treatment of wastes with relatively high organic content, even though organic constituents other than PCBs do not contribute appreciably to risk associated with the Source Area 2 waste.

In its evaluation of the S/S technology, the U.S. EPA has arbitrarily applied performance standards for waste leachability, strength, and quality control that are inconsistent with ARARs, inconsistent with standards the U.S. EPA intends to apply to stabilized incinerator ash, and inconsistent with standards typically applied by U.S. EPA for S/S technologies. The U.S. EPA's own design for the incineration remedy specifies that the performance standard for ash stabilization is in compliance with regulatory TCLP levels in accordance with land disposal restrictions. Yet U.S. EPA has not demonstrated in its Design Document for the on-site incinerator that the raw or stabilized ash produced by its incineration remedy would meet this and other ARARs for on-site land disposal.

DISCUSSION

A. U.S. EPA Site Characterization

ISSUE 1: U.S. EPA's RI data analysis dramatically underestimated the concentration of lead, other metals, and VOCs, including precursors to dioxin and furans, in Source Area 2 materials.

U.S. EPA RESPONSE: The RI included an analysis of the multi-media samples for lead, among other things, and determined the average concentration for lead in soil and filter cake to be 367 ppm. This lead concentration was used, along with other data, to determine the risk posed by the entire source area and that risk should not be construed to be the risk posed solely by the soil and filter cake material in Source Area 2.

PRP RESPONSE: U.S. EPA has failed to provide a meaningful response to the issue. The issue raised by the PRPs was that RI dramatically underestimated the concentration (not the risk) of Source Area 2 contaminants and, therefore, the FS could not and did not accurately consider potential impacts of emissions of the proposed incinerator on public health and environment. The following table summarizes the PRPs' review of the data.

DATABASE ID	AVERAGE CONCENTRATIONS (μg/kg) TOTAL HALOGENATED SOLVENTS	BENZENE	ETHYL BENZENE
RI	37	20	567
TAMS	10,800	390	3,133
Kiber	15,300	399	3,336

DATABASE ID	LEAD CONCENTRATION (mg/kg) MIN. CONC.	MAX. CONC.	AVG. CONC.
RI	--	2,200[1]	367
TAMS	540	17,100	4,072
Kiber	2,600	36,000	14,500

[1] For the purpose of calculating an average concentration for use in RI/FS and the ROD, the actual maximum value of 14,600 mg/kg was changed to 0 mg/kg by EPA.

If, as U.S. EPA claims, it intended to analyze the multi-media samples to determine the average concentration of contaminants in Source Area 2, the calculation of the averages should have been weighted by the estimated mass of each medium (soil versus filter cake) and should have considered the variability of contaminant concentration in each medium. Calculating a simple arithmetic average of data by ignoring the influence of these factors is inconsistent with U.S. EPA guidance for analysis of stratified sampling data where the data exhibits substantial non-random heterogeneity (U.S. EPA, November, 1986). The methods used by the U.S. EPA introduced an arbitrary bias into the calculation and resulted in the underestimation of the concentration of total halogenated solvents, ethyl benzene, lead, and benzene in the Source Area 2 materials.

The NCP includes the goal of protection of public health and the environment. Reliable estimates of the concentration of the first three contaminants are critical to any evaluation of the potential impacts of on-site incineration on public health and the environment. The detailed analysis of alternatives in the 1988 FS is silent with regard to the potential significance of lead and precursors to dioxin and furans on the short-term impacts from on-site incineration. The failure of the U.S. EPA specifically to acknowledge the potential importance of these contaminants to emissions of toxics from an on-site incinerator prevented the public from understanding the public health issues related to the proposed incinerator. The underestimation of contaminant concentrations prevented knowledgeable scientists and engineers within the U.S. EPA, PADER, and industry from: (1) recognizing the probable significance of lead and precursors of dioxin and furans on the emissions from an on-site incinerator, and (2) disclosing the potential for such emissions as a public health issue.

The 1989 ROD for the Douglassville site continues the U.S. EPA's misrepresentation of lead concentrations in Source Area 2 materials. Table 1 of the ROD (which is a reproduction of Table ES-2 of the RI/FS) represents the average concentration of lead as being in the range of 367 to 1,090 ppm. These values actually represent EPA's miscalculation of the mean lead concentration in subsurface soils (367 ppm) and the mean lead concentration in surface soils (1,090 ppm). This representation of lead concentration is based on calculations which are inconsistent with U.S. EPA guidance regarding statistical treatment of data (U.S. EPA, April 1989 and Gilbert, 1987 which is commonly referenced in EPA guidance) and tends to underestimate dramatically the actual lead concentration. While the ROD states that "lead emissions from the on-site thermal treatment unit would comply with NAAQS and PADER air quality standards ..." (see page 42), the data provided to the public and PADER to evaluate the likelihood of such compliance were, in fact, arbitrarily biased low. Consequently, the public and PADER were not presented accurate information with which to evaluate the performance of the proposed thermal treatment unit. The public and PADER had to rely on faulty estimates of the lead concentration from Source Area 2 to assess the likely protectiveness of "air pollution controls ... required to remove risks to the community from thermal treatment unit air emissions" (see page 51 of the ROD) and to evaluate the likelihood that "the selected remedy will not pose any unacceptable short-term risks or cross-media impacts" (see page 55 of the ROD).

The Responsiveness Summary to the ROD indicates that the public attempted to assess the public health significance of emissions from the thermal treatment unit and reasonably relied on the U.S. EPA's faulty representation of lead concentration in Source Area 2 materials to comment on the draft ROD. Commenters questioned whether the October 1988 RI/FS adequately addressed the potential short-term and long-term risks associated with the possible release of airborne contaminants during the thermal treatment process (see page 4, Responsiveness Summary). The U.S. EPA's response states that "all required and necessary standards and precautions would be implemented to assure that the thermal treatment process would not pose an endangerment to human health or to the environment because of the potential release of airborne contaminants" (see pages 4-5, Responsiveness Summary). At the time the ROD was issued, the U.S. EPA had, in fact, failed to consider and include all necessary standards and precautions to assure that the thermal treatment process would not pose an endangerment to human health or the environment. The U.S. EPA arbitrarily underestimated the concentration of site contaminants of greatest concern to the release of airborne toxics, did not conduct a thorough evaluation of human health risks and ecological risks, and did not identify any standards or precautions specifically designed to avoid, minimize, or mitigate such risks. As discussed elsewhere in this document, U.S. EPA has continued to underestimate the concentration of site contaminants relevant to the emission of airborne toxics and has made other arbitrary and inappropriate decisions which are inconsistent with adequately assuring that the thermal treatment process will not pose an endangerment to human health or the environment.

The U.S. EPA is being disingenuous in asserting that the average lead concentration of 367 ppm was calculated to determine the risk posed by the <u>entire</u> source area. This average includes data from samples collected as deep as 15 feet below the ground surface, which would not materially contribute to risks evaluated by U.S. EPA in the RI (e.g., direct contact, ingestion, inhalation, and erosion) because the public would not be exposed to contamination at such depths. Including such data in a calculation of an average concentration for use in evaluating risks posed by Source Area 2 is inconsistent with U.S. EPA guidance (U.S. EPA, 1992) and is meaningless in the evaluation of such risks. In fact, the RI evaluated risks posed by lead in Source Area 2 by considering the lead concentration in surface soils which, according to the U.S. EPA, has an average concentration 1,090 ppm.

U.S. EPA RESPONSE: The U.S. EPA has reviewed the PRPs' sampling results and determined that the 36,000-ppm sample is an "outlier" and should not be used in determining the average lead concentration. Its inclusion would incorrectly skew the average concentration of the lead upwards. Of the 26 samples taken of filter cake, if the highest lead concentration reported (36,000 ppm) and the lowest lead concentration reported (540 ppm) are determined to be "outliers" and the remaining 24 samples are averaged, the average lead concentration for the filter cake waste is 4,085 ppm.

PRP RESPONSE: The U.S. EPA has presented no scientific basis for omitting this data. The U.S. EPA's arbitrary decision is inconsistent with the U.S. EPA's own guidance (U.S. EPA, April 1989 and Gilbert, 1987 which is commonly referenced in EPA guidance) which requires that a statistical basis be used to determine whether an observation is statistically different from the rest of the data and that an observation be corrected or dropped, only if it can be determined that an error (e.g., in transcription, dilution, analytical procedure, etc.) has occurred. No statistical basis for dropping the observation (36,000 ppm) in question is offered by the U.S. EPA. Barr's statistical evaluation of this observation indicates that this observation must be retained as a true extreme value (see Hawkins letter of May 18, 1994). The U.S. EPA offers no evidence that an error is associated with the observation at issue. Barr is not aware of any evidence that would suggest that the observation is in error. To the contrary, Barr and the U.S. EPA are aware that mass balance analyses performed for the U.S. EPA's Thermal Treatability Testing Report indicate an inability of standard analytical tests methods to detect all of the lead in the filter cake and that many samples of filter cake collected during the RI were flagged as being biased low. This information provides a clear indication that other data used by the U.S. EPA to characterize filter cake lead contamination should be suspected of skewing the average concentration of lead downward. This circumstance is confirmed by other analyses performed by the PRPs which indicate that the concentration of lead in filter cake samples collected for the PRP's treatability studies is well above EPA's reported average concentration of 4,072 ppm (see Mattsfield memo of 28 April 1994, attached). The deletion of the maximum concentration observation under these circumstances is arbitrary and capricious and shows a disturbing disregard for protection of human health and the environment.

U.S. EPA RESPONSE: With respect to VOCs, Source Area 2 was studied during the RI to characterize the source area for the general purposes of an RI as noted above, not for the specific purpose of designing the response action. Average concentrations of VOCs were calculated for the entire source area, not just for the filter cake waste, using the RI methodologies.

PRP RESPONSE: The U.S. EPA is misrepresenting the general purpose of an RI and has failed to address the issue raised by the PRPs. Remedial investigations are conducted to characterize the contamination at the site and to obtain information needed to identify, evaluate, and select cleanup alternatives. Under the NCP, the U.S. EPA had an obligation to collect and analyze the data necessary to satisfy both purposes in a manner which was scientifically defensible, consistent with the applicable U.S. EPA guidance, and ensures protection of public health and environment. The U.S. EPA failed to collect, analyze, and evaluate site characterization data in a manner which satisfies these obligations. The RI data dramatically underestimate VOC concentrations, including incineration precursors to dioxin and furans, in Source Area 2 materials (refer to the table above). The FS and the ROD are silent with regard to the potential for formation of dioxin and furans during incineration of Source Area 2 wastes. Therefore, the U.S. EPA failed to disclose to the public relevant information relating to the potential public health hazards of the proposed remedy. Given the heightened public awareness and concern regarding incineration and potential exposure to these highly toxic compounds, the U.S. EPA has failed to solicit meaningful public involvement as required under the NCP. (For example, one could ask whether elderly people with diminished lung capacity living in an adult care facility across the highway from the site feel that they have been fully informed of the potential health impacts of the proposed incinerator.) The U.S. EPA's underestimation of VOC concentrations in Source Area 2 prevented knowledgeable scientists and engineers in the U.S. EPA, PADER, and industry from: (1) recognizing the probable significance of precursors of dioxin and furans on the emissions of an on-site incinerator and (2) disclosing such emissions as a public health issue.

The closing paragraph in the U.S. EPA's response to Issue 1 provides an argument as to the consistency of the TAMs data and the Kiber data for VOCs, attempts to assume credit for such an argument, and implies that this argument is relevant to the PRPs' issue. This is disingenuous in that the PRPs' written agenda for the November 19, 1993 meeting between the U.S. EPA and the PRPs specifically states that the TAMs data and the

Kiber data show that the RI data did not accurately characterize the waste that was to be incinerated. The PRPs never disputed the consistency of the TAMs data and the Kiber data; the PRPs did contest the accuracy of the RI data and its consistency with the TAMS and Kiber data. Again, the U.S. EPA has failed to meaningfully address the issue and explain how the public could have made meaningful comment on the draft ROD when the U.S. EPA underestimated the concentration of incineration precursors to dioxin and furans (total halogenated solvents) by more than two orders of magnitude.

SUMMARY OF ISSUE

The U.S. EPA has glossed over the fact that the U.S. EPA's RI data dramatically underestimated the concentration of lead, other metals, and VOCs in Source Area 2 wastes in an attempt to give the appearance that the RI/FS was a sound analysis. What is most troubling about the U.S. EPA's response is the apparent unwillingness to: (1) objectively review misrepresentations that were made to the public; (2) consider the significance of these misrepresentations to the public's perception of issues related to incineration of Source Area 2 materials; (3) take responsible action in informing the public of the misrepresentations; and (4) provide a forum for the public to consider the significance of the misrepresentations to the Detailed Analysis of Remedial Alternatives required under the NCP. Given the U.S. EPA's response to the issue raised by the PRPs, it is apparent that the U.S. EPA is more concerned about defending an administrative decision than reasonably informing the public of issues related to remedy selection and seriously considering the public's acceptance of the U.S. EPA's on-site incineration remedy.

ISSUE 2: The PRPs contend that the U.S. EPA's RI data incorrectly summarized average lead levels at the site. Specifically, the RI data summaries assumed values of 0 for 10 of 21 samples used to calculate an average lead concentration and 11 of the 21 samples were soils, not waste.

U.S. EPA Response: As noted previously, the average lead concentration for Source Area 2 developed during the RI is derived not only from the concentrations of lead from the filter cake samples, but also takes into account the usually lower lead concentrations of the surface soil samples in the source area.

PRP Response: The PRPs agree that the U.S. EPA computed average lead concentrations for Source Area 2 by pooling data involving both filter cake and soil. In doing so, the U.S. EPA calculated an average lead concentration for Source Area 2 which was biased low. The U.S. EPA incorrectly combined data that are two orders magnitude different and represent two types of media. The U.S. EPA also failed to weight the computed average concentration by the mass of each type of media within Source Area 2. Further, the U.S. EPA failed to consider the variability of lead concentration within each type of media. Since the mass of contaminated soil estimated to be within Source Area 2 was substantially smaller than the mass of filter cake, the "average" concentration of lead calculated by the U.S. EPA is arbitrarily biased low. Since the variability of lead concentration in the larger mass of filter cake is great, the uncertainty of the "average" concentration of lead calculated by the U.S. EPA is also great. The U.S. EPA arbitrarily ignored the significance of this uncertainty in representing the average lead concentration for Source Area 2 materials and in doing so failed to take reasonable measures required by U.S. EPA guidance (U.S. EPA, May 1992) to assure that the true average concentration would not be underestimated.

U.S. EPA Response: U.S. EPA provides a restatement of the "L" and "K" qualifiers assigned to the lead data contained in the RI. The U.S. EPA then states that: "The RI/FS contractor, the Remedial Project Manager ("RPM") and the EPA's technical support personnel reviewed the individual sample analysis results in light of the data qualifiers. If the sampling result was judged to be unreliable by the technical reviewers, the value was not factored into the calculation for the average."

PRP Response: The key issue here is that the U.S. EPA reviewed the data, made a judgement about the reliability of the data, and decided how to use the data in the calculation of an average concentration which was to be subsequently used in: (1) assessing the significance of lead in the characterization of site contamination; <u>and</u> (2) identifying, evaluating, and selecting a cleanup alternative. The U.S. EPA was arbitrary and capricious in performing this task. The decisions the U.S. EPA made about the use of the data are contrary to the intent of the "L" qualifier. As the U.S. EPA's response indicates, when data values are labeled with an "L" qualifier, it means that the reported lead concentration for that value may be biased low and that actual concentration is <u>expected to be higher</u>. For reasons which the U.S. EPA has failed to explain, the U.S. EPA arbitrarily changed data values labeled with an "L" to zero. In doing so, the U.S. EPA took data which was already suspected of being biased low and consciously biased the values even lower.

The U.S. EPA states in its response to Issue 2 that "... if the sampling result was judged to be unreliable by the technical reviewers, the value was not factored into the calculations for the average." This statement cannot be technically sustained. While it is true that the actual "value" was not factored into the calculation for the average, a surrogate for the value, a zero, <u>was</u> factored into the calculation (see Table 1). Factoring a zero into the calculation had the effect of the U.S. EPA's implying that the <u>majority</u> of the black oily filter cake from Source Area 2 contained <u>no lead</u>, when, in fact, the U.S. EPA'S own analytical data indicated that actual lead levels could range as high as 1.5 percent (14,600 ppm). The U.S. EPA's calculated average concentration of lead was 367 ppm and is biased so low that, with one exception, every sample of filter cake waste analyzed by the U.S. EPA was reported to have a lead concentration <u>in excess</u> of the computed average. Whatever the U.S. EPA's intent was with regard to interpretation of the "L" data qualifiers, the result of the interpretation is nonsensical, misleading, and not protective of human health.

The U.S. EPA's apparent defense of the data analysis procedures used in the RI/FS is inexplicable in light of the U.S. EPA's mandate to protect human health and the environment and its expressed concerns regarding the health effects of emissions of toxic metals, including lead, from incinerators. Apparently the U.S. EPA believes the arbitrary modification of analytical data developed to characterize conditions at a Superfund site is justifiable under certain circumstances, as the U.S. EPA neither admitted that the procedures used for lead data analysis were inappropriate or that such procedures would be reasonably misleading to the public in commenting on the U.S. EPA's remedy selection.

U.S. EPA RESPONSE: The Remedial Design ... focused upon the actual filter cake material in Source Area 2, where it was found that the average lead concentration is 4,072 ppm. It is this concentration of lead that was used in the development of the Remedial Design for the on-site incineration remedy and to assess risks resulting from direct exposure pathways associated with the implementation of the remedy.

PRP RESPONSE: The U.S. EPA misrepresents the information contained in the Remedial Design Specifications (U.S. ACE, March 1993) and the Final Design Analysis (TAMS, March 1993). Page 6-3 of the Final Design Analysis states that field sampling data from the Phase II Remedial Investigation (RI) shows that lead "ranges from" 367 ppm to 1,092 ppm. This characterization of the RI data is misleading and underestimates the potential for maximum concentrations of lead in the filter cake. The values reported (367 ppm and 1,092 ppm) are actually average concentrations not minimum and maximum concentrations as the phrase "ranges from" implies. The actual maximum concentration reported in the RI was 14,600 ppm.

As discussed previously, the U.S. EPA's representation of the average lead concentration as ranging from 367 ppm to 1,092 ppm is also incorrect and would be potentially misleading to vendors responding to the U.S. EPA's request for proposals to incinerate Source Area 2 materials.

The U.S. EPA does report in other sections of the Final Design Analysis that the overall average lead concentration for Source Area 2 is 4,072 ppm (see Table 7.1-6) and that the waste composites from Source Area 2 ranged from 1,690 to 5,759 mg/kg (540 to 17,100 mg/kg in individual samples) (see page 6-12). However, the U.S. EPA again misrepresented the lead concentrations for composite samples. These data are actually average concentrations of discrete samples collected from various areas within Source Area 2 and are not actual results of laboratory analyses performed on composite samples. In fact, the U.S. EPA has never reported the concentrations of lead in the composite samples. The U.S. EPA disqualified this data in the Quality Control Summary Report for the Pre-Design Investigation and has never revealed the results of these analyses to the public. The U.S. EPA's explanation for disqualifying this data was in-part that "... review of the data from these supplemental samples indicates serious discrepancies or inconsistencies with previous or expected results (page 7-1 and 7-6, Quality Control Summary Report)." Disqualification of data because the U.S. EPA believes the results to be inconsistent or unexpected is arbitrary and withholding such data from public review interferes with the public's ability to evaluate completely the work conducted by the U.S. EPA. This is disturbing because thorough review of such data could alter the scientific interpretation of U.S. EPA's Thermal Treatability Testing Report.

SUMMARY OF ISSUE

The U.S. EPA's RI data analysis incorrectly summarized the average concentration of lead in Source Area 2 materials by inappropriately combining data from two distinct sample populations into the calculation of an average concentration. The U.S. EPA incorrectly calculated a biased average lead concentration which dramatically underestimates the concentration of lead in Source Area 2 by inappropriately assuming a value of 0 for 10 of 21 samples included in the calculation of an average lead concentration. The U.S. EPA has repeatedly misrepresented the concentration of lead in Source Area 2 materials by making inappropriate references to composite sample data and calculated average concentrations. The U.S. EPA has withheld data from the public which is material to understanding and evaluating the work conducted by the U.S. EPA.

B. <u>The PRPs' Proposed Alternative Remedy of Soil Stabilization and Solidification</u>

The April 21, 1994 U.S. EPA Region III Response includes a summary of U.S. EPA's present rationale for rejecting the S/S or immobilization remedy and responses to specific issues regarding the S/S remedy. The discussion in the Region III Response is based on a memorandum that was prepared by Patricia Erickson of the U.S. EPA's Office of Research and Development in Cincinnati (Erickson, 1993).

Following is a summary of comments on the U.S. EPA responses to specific issues related to S/S technology that were presented in the U.S. EPA Region III Response. The issues and U.S. EPA responses are briefly summarized and the reader is referred to the Region III Response for more complete descriptions of the issues and U.S. EPA responses. These comments demonstrate the arbitrary and capricious nature of the U.S. EPA's rejection of the S/S remedy and the errant conclusions reached by the U.S. EPA based on its application of NCP evaluation criteria.

<u>ISSUE 1</u>: Based on "new" waste characterization data, the FS should have provided a more thorough evaluation of S/S alternatives.

U.S. EPA RESPONSE: The waste characterization data included in the PRPs' Treatability Study is not "new" information and is consistent with information contained in U.S. EPA's existing Administrative Record for the site.

PRP RESPONSE: The U.S. EPA has not adequately responded to this issue. New information regarding the appropriateness of an S/S remedy has been obtained through: (1) additional waste characterization data developed by the PRPs; <u>and</u> (2) additional treatability study data developed by the PRPs and advances in S/S technology; <u>and</u> (3) a review of the U.S. EPA's existing database for the site. As previously described, new waste characterization data collected subsequent to the RI/FS and an accurate interpretation of data collected prior to and during the RI/FS demonstrate that Source Area 2 characterization data had not been accurately interpreted by the U.S. EPA during the RI/FS. EPA admits that the RI determined the average lead concentration in Source Area 2 to be 367 ppm. Data collected by EPA during the Pre-Design Investigation support a revised characterization of the lead content. EPA determined the average lead concentration in Source Area 2 filter cake to be 4,072 ppm during the Pre-Design Investigation. As a result, the metals content of the waste justifies a reexamination of S/S technologies. Had the waste been properly characterized during the RI/FS process, the elimination of S/S technology prior to conducting a detailed analysis of alternatives would not have been defensible. The new treatability study data are discussed in responses to issues that follow.

U.S. EPA RESPONSE: The presence of oily waste would have eliminated the S/S technology as a remedial alternative, and U.S. EPA was correct to "screen out" this technology.

PRP RESPONSE: The U.S. EPA Region III Response to this issue refers to U.S. EPA guidance that the S/S technology is inappropriate for wastes containing greater than 10 percent oil and grease (U.S. EPA, 1988). A review of this guidance reveals two sources for this criterion. The first is "vendor information", although no specific vendors are identified. Since the issuance of this guidance document, considerable advances have been made by technology vendors and researchers in applying S/S technology to the treatment of waste with relatively high organic content. The second source of information cited to support the 10 percent oil and grease criterion was another U.S. EPA guidance (U.S. EPA, 1986a).

However, a review of this guidance shows that fixation (S/S) is considered applicable or potentially applicable for organic sludges and soils and that some vendors have processes that can handle up to 100 percent organics.

As further described later in the response below, the U.S. EPA has been capricious in its evaluation of S/S technologies by providing inconsistent and unsupported justification for screening out S/S technologies. The current rationale stated in U.S. EPA's response to this issue (presence of an oily waste) refers to an arbitrary standard that is not supported by U.S. EPA guidance or scientific evidence. The oily matrix does not limit the S/S technology's effectiveness at immobilizing waste constituents that contribute to risk.

The S/S alternative was retained following technology screening during the FS, despite the organic content of the waste, and was screened during alternative screening prior to development of a comprehensive remedy that would include S/S technologies. In screening the alternative based on the results of a treatability study involving only one process option, EPA was inconsistent with a statement in the RI/FS (NUS, 1988, p. 289) that "The effectiveness of solidification processes is dependent on properly-conducted bench-scale testing to determine the most appropriate additives and mix ratios."

ISSUE 2: The S/S technology can immobilize the contaminants of concern.

U.S. EPA RESPONSE: Immobilizing only certain contaminants of concern is not sufficient in choosing a Superfund remedy. The U.S. EPA must select a remedy in accordance with the NCP that meets the threshold criteria of overall protection of human health and the environment by reducing the risk posed by all hazardous substances to acceptable ranges. It may be accurate that the S/S technology would immobilize lead and PCBs, which were identified in the U.S. EPA's Risk Assessment in the RI as posing the greatest risks, but other contaminants (specifically VOCs and SVOCs) pose risks and would not be immobilized. (In support of this argument, the U.S. EPA Region III Response refers to an accounting in the Erickson memorandum of TCLP concentrations for treated and untreated waste.)

PRP RESPONSE: Tables 1 and 2 from the Erickson memorandum have been reproduced and attached to this letter as Tables 2 and 3. The results of duplicate TCLP testing of a sample that had cured for 443 days have been added to the tables. These results were previously reported to Thomas Voltaggio of the U.S. EPA on April 5, 1994. Information regarding regulatory TCLP standards and maximum contaminant level (MCL) standards for drinking water has also been added to the tables.

Following the format used in the Erickson memorandum, Tables 2 and 3 indicate whether increases, decreases, mixed effects, or uncertain effects on leachability were observed for the various constituents. Mixed effects refer to the condition in which one of a pair of duplicates shows an increase and the other duplicate result shows a decrease. Uncertain effects refer to the inability to draw conclusions because the values are estimated, the values are nearly identical, or different analytical detection limits for untreated and treated samples mask any possible changes in leachability.

It can be demonstrated that there is little significance to the apparent increases in contaminant leachability following treatment. The compounds that exhibited increases in leachability, mixed effects, or uncertain effects do not contribute significantly to risks posed by Source Area 2 waste. This is demonstrated by the following evaluation and supported by the U.S. EPA's baseline risk assessment which estimates zero cancer risk and zero hazard index for each of these compounds. Table 4 summarizes comments regarding each of these compounds.

In most cases, the TCLP concentration were less than TCLP and MCL standards where these standards exist. Other constituents were dismissed as insignificant during the baseline risk assessment because they were infrequently detected in soil and groundwater samples. Other constituent concentration were very near the analytical detection limits, making it impossible and meaningless to assess changes in leachability.

The Erickson memorandum states that duplicate samples of Formulation 14 showed increases in leachability or mixed effects following 42 days of curing for 6 of 17 VOCs that were detected in at least one sample. Actually, according to the U.S. EPA, the effects were mixed for five VOCs and uncertain for one VOC.

The TCLP concentrations of two of the VOCs that showed mixed effects after 42 days (ethyl benzene and toluene) were less than 3 percent of the MCL standards for those compounds. This indicates that the concentrations of these compounds in TCLP extracts are at levels considered safe for drinking water. The TCLP concentrations of another VOC (tetrachloroethene) after 42 days were below or nearly identical to the MCL for that compound. Both duplicate samples after 443 days showed reductions for these three compounds compared to the untreated waste. MCLs do not exist for the other three VOCs for which mixed effects or uncertainty were observed. However, all TCLP concentrations of one VOC (2-butanone) were at least three orders of magnitude below the regulatory TCLP limit. The TCLP concentrations of the remaining two compounds that showed mixed effects after 42 days (carbon disulfide and 2-hexanone) were below or near the detection limits for those compounds. Carbon disulfide was not detected following 443 days. In addition, 2-hexanone was detected in a Schuylkill River sample collected during the RI at a concentration (12 $\mu g/L$) similar to concentrations in the TCLP extracts. Also, the baseline risk assessment in the RI explicitly stated that 2-butanone and 2-hexanone were infrequently detected in groundwater and soil samples and are not toxic at the low levels detected at the site.

Three additional VOCs showed increases in leachability or mixed effects following 443 days of curing. Chloroform concentration increased slightly although the concentrations were at least 30 times lower than the MCL and 2,000 times lower than the TCLP criteria for that compound. 1,1-Dichloroethane was not detected in any of the treated samples and showed mixed effects only because the detection limit after 443 days was higher than the detection limit for the untreated sample. MIBK was detected at concentrations nearly identical to those measured for the untreated sample. The baseline risk assessment in the RI explicitly stated that this compound was infrequently detected in groundwater and soil samples and is not toxic at the low levels detected at the site.

The Erickson memorandum states that duplicate samples of Formulation 14 showed increases in leachability following 42 days of curing for 6 of 14 SVOCs in both duplicate samples and increases in leachability for two more SVOCs in one of two duplicate samples. Leachability was reduced for four SVOCs and uncertain for two SVOCs.

The TCLP concentrations of two of the SVOCs that showed increases in leachability after 42 days and/or 443 days (bis[2-ethylhexyl]phthalate and 1,2-dichlorobenzene) were below MCLs for those compounds. MCLs and regulatory TCLP limits do not exist for the other eight SVOCs for which increases, mixed effects, or uncertainty were observed after 42 days. The risk assessment in the RI stated that three of these compounds (di-n-butylphthalate, 2-methylphenol, and 4-methylphenol) were not considered in the risk assessment because they were infrequently detected in groundwater and soil samples at the site. The quantitative risk assessment for phenol was intended to represent toxic effects of the substituted phenols (2-methylphenol, 4-methylphenol, and 2,4-dimethylphenol). Di-n-butylphthalate was not detected, and 4-methylphenol showed a decrease after 443 days. All TCLP concentrations of phenol, a compound exhibiting an increase in leachability following treatment, were significantly lower than the ambient water quality criteria (3,500 µg/L) for that compound. The TCLP concentrations of naphthalene, a compound exhibiting uncertain effects after 42 days and a slight increase following 443 days, were far below the U.S. EPA's long-term health advisory concentrations in drinking water of 400 µg/L for children and 1,000 µg/L for adults. The TCLP concentrations of the remaining three compounds that showed mixed or uncertain effects after 42 days (benzyl alcohol, 2-methylnaphthalene, and phenanthrene) were near the detection limits for those compounds. Phenanthrene was not detected after 443 days. The TCLP concentrations of 2-methylnaphthalene was less than the average concentration in groundwater monitored at the site during the RI.

The Erickson memorandum states that the relatively low leachability of VOCs and SVOCs in this waste hinder a clear interpretation of treatment effects. TCLP analyses for total petroleum hydrocarbons showed barely measurable concentrations and TCLP results for PCBs were less than detection limits for both untreated and treated samples. Rejection of the S/S remedy based on these observations ignores the valid conclusion that the untreated waste does not present a risk to human health and the environment through the leaching of these contaminants.

This information supports a conclusion that the S/S technology meets the threshold criteria of overall protection of human health and the environment for all hazardous substances. This conclusion is supported by an observation in the Oberacker memorandum (Oberacker, 1993) that: "In and of themselves and despite the impact of hearing the names of these chemicals (chlorinated solvents and other hazardous organics such as PAHs) that are apparently actually there, their low amounts probably mean they do not present a very serious environmental hazard."

U.S. EPA RESPONSE: The stabilized waste will not comply with the RCRA Corrective Action Management Unit (CAMU) Rule, an ARAR, because the remediated wastes will not meet regulatory levels for TCLP leaching tests.

PRP RESPONSE: All TCLP concentrations of the detected organic compounds were significantly lower than TCLP levels for regulated compounds and would be in compliance with the CAMU Rule. The U.S. EPA Region III Response is inaccurate and misleading in suggesting that the remediated wastes would not pass TCLP leaching tests.

U.S. EPA RESPONSE: The S/S technology's inability to immobilize hazardous substances would have adverse impacts to the floodplain in violation of federal directives that are considered ARARs.

PRP RESPONSE: In addition to treating wastes to levels far below TCLP regulatory limits, the conceptual plan for this remedy that has been proposed by the PRPs requires locating the disposal cell in an area outside of the floodplain. Therefore, federal directives regarding land disposal in floodplains would not be ARARs.

ISSUE 3: The S/S technology will be effective in the long term.

U.S. EPA RESPONSE: The S/S technology has not demonstrated its long-term effectiveness and permanence, as required by the NCP, because the treatability results do not demonstrate that VOCs and PAHs are bonded in the stabilization matrix. Total waste analysis (TWA) data are not conclusive regarding the binding effect of the S/S technology on organic compounds.

The TWA analyses were conducted during the PRPs' treatability study: (1) to assess whether a representative sample had been collected; (2) to assess potential interferences by organic compounds for the purpose of selecting appropriate treatment reagents; (3) to assess whether treatment significantly increases extractable organic compound concentrations; and (4) to assess whether organic compound transformation, destruction, or fixation has occurred. The first three of these purposes have been satisfactorily assessed. The observation that TWA concentrations have not significantly decreased, based on comparisons of concentrations before and following treatment, does not lead to a conclusion that the remedy is not effective in the long-term or not permanent.

In order for long term effectiveness and permanence to be an issue, the contaminants must be present in concentrations that significantly threaten human health or the environment. This is not the case. The U.S. EPA's own baseline risk assessment for the site and data generated by the U.S. EPA and the PRPs demonstrate that VOCs, SVOCs, and other petroleum hydrocarbons present very low risks to human health and the environment. The U.S. EPA is arbitrarily concerned about low concentrations of organic constituents in TCLP and TWA analysis extracts. The inability of the proposed S/S technology to reduce total and leachable organic contaminant levels to below detection limits is not an indication that the technology does not meet long-term effectiveness and permanence requirements. The success of the proposed S/S technology is clearly shown by its ability to treat VOCs and SVOCs to below TCLP standards.

In addition, the S/S remedy design that has been proposed by the PRPs includes disposal of treated material on-site in a residual waste landfill. The landfill, designed in accordance with PADER requirements, would effectively eliminate any potential for leachate migration and direct contact with the treated material.

U.S. EPA RESPONSE: The S/S technology has not demonstrated its long-term effectiveness and permanence, as required by the NCP, because calcium and magnesium increased significantly in leachability after the S/S treatment (and 42 days of curing), probably due to the leaching of binding materials used for the treatment, and this will reduce the long-term effectiveness of the S/S treatment.

PRP RESPONSE: The U.S. EPA Region III Response and Erickson memorandum accurately suggest that the increases are due to the leaching of binding materials used for the treatment. Calcium and magnesium are ingredients in Portland cement, which is one of the components of the S/S reagent. Quantities of calcium and magnesium in excess of those required to produce the binding effects of cement were added during treatment. It is expected that binding materials will leach from treated waste at concentrations in excess of those that will leach from the untreated waste because of the addition of large quantities of these nonhazardous metals in the S/S process. The Erickson memorandum adds that the results of MEP testing (which clearly demonstrates metals immobilization) somewhat alleviate concerns regarding matrix dissolution.

U.S. EPA RESPONSE: The S/S technology has not demonstrated its long-term effectiveness and permanence, as required by the NCP, because supplemental information submitted by the PRPs demonstrated that a sample which had cured for 443 days experienced an 8 percent loss in unconfined compressive strength (UCS) as compared to a sample which had cured for 42 days. This loss of strength could eventually result in a physical breakdown of the product and lead to a potential release of contaminants.

PRP RESPONSE: We disagree about the significance of the data. First, six samples were tested following 42 days of curing. The average UCS value was 166 psi with a standard deviation of 44 psi. The result for the single sample tested following 443 days of treatment was 153 psi, which is statistically insignificant from the earlier results. Second, all measured UCS values far exceed the strength requirements necessary to support the capping system for a PADER Class I residual waste management landfill and far exceed the U.S. EPA's guideline of a minimum strength of 50 psi for stabilized waste (U.S. EPA, 1989a, p. 4-13) which is also the standard that the U.S. EPA intends to apply to stabilized ash.

Third, the difference in UCS values measured after 42 and 443 days is approximately equal to the average variance of 8.1 percent for the ASTM method (U.S. EPA, 1989a, p. 4-13). This is another indication that there is no significant difference between the results.

The U.S. EPA has ignored the results of material loss measurements following wet/dry and freeze/thaw durability testing. Material loss is measured by comparing the weight of a treated specimen before and after repeatedly applying environmental stresses. The results show that the treated samples far exceed standard requirements for these tests of less than 15 percent mass loss. All results showed less than 1 percent mass loss.

U.S. EPA RESPONSE: The Erickson memorandum includes additional comments regarding lead concentrations in TCLP extracts of durability testing control samples and the significance of these results with respect to long-term effectiveness and permanence. The Erickson memorandum points out that several control samples analyzed during durability testing that were not subjected to durability testing stresses produced lead concentrations that exceeded the regulatory limit for lead. Ms. Erickson concluded that these results indicate a need for further work on waste characterization or formula development.

PRP RESPONSE: Table 5 is attached which summarizes all TCLP lead results that have been measured for Formulation 14. The control samples with TCLP lead concentration exceeding the regulatory limits represent less than 15 percent of the samples for which TCLP lead concentrations were measured. The results show that TCLP lead concentrations were less than detection limits in triplicate samples following a cure time of 282 days and duplicate samples following a cure time of 443 days. These data indicate that extended cure time is not increasing the leachability of lead from the treated material.

Failure to achieve the treatment goal (lead concentrations less than 5 mg/L in TCLP extracts) may result from factors including incomplete mixing, waste inhomogeneities, or pH effects. As with other technologies (e.g., incineration and ash stabilization), success in meeting immobilization treatment goals for 100 percent of the treated material is not always achievable. The conceptual plan for the S/S remedy that has been proposed by the PRPs includes an assumption that approximately 15 percent of the treated material will require retreatment following testing. Because retreatment can be accomplished with relative ease, failure to achieve treatment goals for 100 percent of the material treated is not a significant problem. EPA's design documents for the incineration remedy indicate that batches of stabilized ash that do not pass TCLP standards may be retreated using the stabilization process.

In conclusion, treatability testing results and the S/S remedy design demonstrate that the NCP requirement for long-term effectiveness and permanence would be met with the proposed S/S technology.

ISSUE 4: Success treating similar wastes using the S/S technology has been demonstrated at other sites.

U.S. EPA RESPONSE: The Sand Springs site waste is not similar to the Douglassville site waste. The TPH content of most samples from the Sand Springs site is in the range of 6 to 8 percent compared to a TPH content of 37 percent for Douglassville site waste.

PRP RESPONSE: Contrary to the U.S. EPA's contention, the U.S. EPA (approved) documents for the Sand Springs site show that the TPH content of waste in the three acid sludge at the Sand Springs site is in the range of 16 to 24 percent ("Tier II Work Plan, Field Demonstration Tests, Chemical Stabilization and Solidification Technologies," prepared for the Atlantic Richfield Company by Morrison-Knudsen Engineers, Inc., January 1991). This TPH content is more similar to the TPH content found in Source Area 2 at the Douglassville site than is the TPH content (6 to 8 percent) that was reported for Sand Springs site waste in the U.S. EPA Region III

Response. We believe that, although the remedy has not yet been implemented, the similarity of the wastes and the U.S. EPA's decision to change the ROD for the Sand Springs site from an incineration remedy to a S/S remedy are sufficient reasons to consider that site in an evaluation of S/S technologies.

U.S. EPA RESPONSE: Barr Engineering Company initially proposed S/S technology and bioremediation for the Arrowhead site, and these remedies were rejected by the U.S. EPA.

PRP RESPONSE: Barr Engineering Company did not propose S/S technology for the Arrowhead site. Barr Engineering Company investigated the feasibility of S/S technology for treatment of waste at that site, but for reasons unrelated to the feasibility of S/S technology, the PRP group and regulatory agencies selected other remedies for waste at the Arrowhead site.

U.S. EPA RESPONSE: The U.S. EPA has not had success treating similar wastes at other sites using S/S technology.

PRP RESPONSE: There are numerous examples of sites where the U.S. EPA has approved or implemented S/S technologies for the treatment of wastes with high organic content as part of emergency response actions, CERCLA remedial actions, and RCRA corrective actions. Table 6 lists some of the sites and describes their location, waste producing operations, wastes and contaminants, and status. This summary is not intended to be all encompassing. Many of the sites contain wastes with mixed organic and inorganic constituents, and many of the sites contain wastes with petroleum hydrocarbon contents similar to the Douglassville waste. Several of the sites are described in more detail here.

The Commercial Oil Services (COS) site in Oregon, Ohio was the location of waste oil, waste sludge, and solvent rerefining operations. The waste is similar to that present in Source Area 2 of the Douglassville site and has a TPH content of approximately 30 percent. The TPH content is approximately 30 percent. VOC and SVOC concentrations are much higher than those in the Douglassville waste. The U.S. EPA selected a stabilization remedy and on-site disposal over an incineration remedy for 77,000 cubic yards of organic lagoon sludges at the site. The remedy includes the collection and treatment of organic compounds that will be volatilized during treatment. A November 1992 Action Memorandum that was prepared by the U.S. EPA for the COS site (U.S. EPA, November 1992) describes the U.S. EPA's rationale for the selection of an S/S remedy based on NCP evaluation criteria. The Action Memorandum includes a statement that "the on-site incineration technology provides no greater environmental protection level than does the selected option of on-site stabilization/solidification, on-site disposal and capping."

The York Oil Company site in Franklin County, New York was the location of waste oil recycling operations. The waste is similar to that present in Source Area 2 of the Douglassville site and has a TPH content of up to 20 percent. The maximum lead concentration is 16,000 ppm, and the maximum PCB concentrations is 230 ppm. VOC and SVOC concentrations are much higher than those in the Douglassville waste. The TPH content of the waste was not reported in the ROD, although free oil phases have been detected in soils and in groundwater monitoring wells. The U.S. EPA selected a stabilization remedy and on-site disposal over an incineration remedy for 30,000 cubic yards of contaminated soil and sediment at the site. The alternatives analysis for the site concluded that on-site solidification reduced the toxicity and mobility of waste constituents, was consistent with the NCP as a permanent treatment remedy, and protected human health and the environment. Regarding long-term effectiveness and permanence, the ROD states that: "Over the long-term, the on-site treatment options provide essentially equivalent protection to the local community, since the residuals are not expected to pose a hazard from a health and environmental perspective." The U.S. EPA concerns regarding a thermal remedy included emissions, downtime and cost, and the potential need to further treat the ash by immobilizing the metals.

The Craig Farm Drum site in Armstrong County, Pennsylvania (U.S. EPA Region III) was the location of resorcinol production (an organic compound used as an adhesive enhancer). Distillation residues were disposed of in two abandoned strip mine pits. The TPH content of the waste is approximately 6 percent. The U.S. EPA selected a stabilization remedy and on-site disposal over an incineration remedy, to the objection of the State of Pennsylvania, for 32,000 cubic yards of contaminated soil at the site. The ROD for the site stated that the selected remedy would greatly reduce or eliminate the potential for migration of potential contaminants of concern. The selected remedy is protective of human health and the environment, complies with ARARs, and is cost-effective compared to the incineration alternative. The U.S. EPA determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner. The U.S. EPA recognized that on-site disposal in a secure landfill, utilizing a double synthetic liner and a leachate detection system, would contain the material with a high degree of certainty over the long term.

Table 7 summarizes treatment performance criteria for these sites listed in Table 6 where we were able to obtain the information. The summarized performance criteria include maximum TCLP levels and minimum unconfined compressive strength. The information supports the PRPs' contention that U.S. EPA, although it has not defined S/S performance criteria for the Douglassville site, appears to be applying standards that exceed those normally required.

SUMMARY OF ISSUES RELATED TO THE PRPS' PROPOSED ALTERNATIVE REMEDY OF SOIL STABILIZATION AND SOLIDIFICATION

Rejection of the S/S Remedy is Arbitrary and Capricious

The U.S. EPA has been capricious in its evaluation of an S/S remedy by providing inconsistent and unsupported justification for screening out S/S technologies. The rationale stated in U.S. EPA's responses to issues regarding the PRPs' proposed S/S remedy (presence of an oily waste) does not coincide with the rationale that was stated in the RI/FS or the rationale stated in the April 21, 1994 Voltaggio memorandum. It appears that the U.S. EPA is not relying on a consistent and defensible rationale for rejecting the S/S remedy and is instead relying on an informal policy that has been adopted regarding the treatment of wastes with relatively high organic content.

The Voltaggio memorandum incorrectly asserts that the S/S technology was screened out during the Feasibility Study because this methodology is not appropriate for wastes containing greater than 10 percent oil and grease. This is not consistent with the rationale stated in the 1988 RI/FS for screening out the S/S technology which included:

1. The volume of waste would increase substantially;

2. The risk associated with solidification and on-site disposal would be no greater than if the waste was landfilled on-site without solidification;

3. The leaching of organics is not reduced by solidification; and

4. Proper additives and solidifying agents may not be available for the site-related contaminants.

As described in the Supplemental Alternatives Analysis Report (Barr, August 1993), the first and fourth contentions are not limitations on the implementability of an S/S remedy. The second contention is not supported by treatability study data. The U.S. EPA has not conducted a risk assessment for either the S/S or landfilling remedies and is being arbitrary in its suggestion that residual risks would be equivalent.

The Voltaggio memorandum states a rationale for rejecting the S/S remedy based on an assertion that it would not be protective of human health and the environment because:

1. The inorganic and organic components of the waste would remain on-site;

2. Most of the VOCs and SVOCs would continue to leach into the environment as demonstrated by the TCLP analysis; and

3. The S/S technology has not demonstrated its effectiveness and long-term permanence by immobilizing the organic components of the waste.

The first contention does not lead to a conclusion that the S/S remedy would not be protective of human health and the environment. The U.S. EPA's incineration remedy would permit inorganic components to remain on-site in a highly concentrated form. Thus, S/S would be at least as protective as on-site incineration in regard to contamination remaining on site.

The contention that "most of the VOCS and SVOCs would continue to leach into the environment" is not demonstrated by the TCLP analyses or any other analytical results. It is not clear whether this statement suggests that more than half of the total mass of organic contaminants will continue to leach or that more than half of the number of detected organic contaminants will continue to leach. In either case, the statement is simply not substantiated. In addition, the treated waste would be placed in a landfill which would limit contact with fluids and eliminate any migration of contaminants that may leach from the stabilized material.

The only common issue included in the U.S. EPA's previous and present rationale for rejecting the S/S remedy is a concern regarding the organic content of the waste. This arbitrary obsession with organic components of the waste is inconsistent with the U.S. EPA's own risk assessment for the site, focusing on the very low risks to human health and the environment associated with oil and grease, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) in the waste.

The U.S. EPA's rejection of the S/S remedy ignores the PRPs' design for a comprehensive remedy that includes the capture of volatile emissions during treatment and the placement of treated material in a residual waste landfill. Both of these design elements would further reduce the potential for adverse effects on human health and the environment by eliminating the potential for leaching to groundwater and eliminating pathways for dermal contact, ingestion, and inhalation. The U.S. EPA's own remedy calls for placing stabilized ash with high concentrations of lead and other metals on-site following treatment.

No performance goals have been established by the U.S. EPA for an S/S remedy. As a result, the S/S remedy can not be fairly evaluated by the U.S. EPA. The U.S. EPA has arbitrarily applied performance standards for the leaching of organic constituents that are inconsistent with ARARs, inconsistent with standards the U.S. EPA intends to apply to stabilized ash, and inconsistent with standards typically applied by the U.S. EPA for S/S technologies. The U.S. EPA has also arbitrarily applied performance standards for strength and quality control testing that are inconsistent with standards the U.S. EPA intends to apply to stabilized ash and inconsistent with standards typically applied by the U.S. EPA for S/S and other treatment technologies.

The U.S. EPA's own design for the incineration remedy specifies that the performance standard for ash stabilization is compliance with regulatory TCLP levels in accordance with land disposal restrictions. Data from the PRPs' treatability study of S/S alternatives show that not only are the TCLP standards met but so are more stringent standards for drinking water quality. The U.S. EPA's design for the incineration remedy has specified a standard of 50 psi for unconfined compressive strength testing of stabilized ash. This standard has been satisfied by all stabilized Mixture 14 specimens that have been tested.

Quality control testing of stabilized ash would be performed and retreatment of material that fails TCLP standards following stabilization would be allowed. This contingency does not appear to have been applied to the S/S remedy as suggested by the U.S. EPA's concern regarding a small fraction of the stabilized samples that failed the TCLP criteria.

NCP Criteria Were Not Properly Applied in
U.S. EPA's Evaluation of the S/S Remedy

The U.S. EPA has applied the two threshold evaluation criteria included in the NCP (overall protection of human health and the environment, and compliance with ARARs) and two of the balancing criteria (long-term effectiveness and permanence; and reduction of toxicity, mobility, and volume) in screening the stabilization technology from further consideration. It is the PRPs' belief that the U.S. EPA has not properly evaluated the technology with respect to these criteria and that the conclusions the U.S. EPA has reached regarding this remedy are not defensible.

A detailed analysis of alternatives that included an S/S remedy has not been conducted by the U.S. EPA. A detailed analysis of alternatives that included the U.S. EPA's incineration remedy and an S/S remedy was previously prepared by the PRPs and submitted to U.S. EPA (Barr, August 1993). The following discussion supplements the discussion in the referenced document.

The S/S remedy mitigates the present impacts associated with the waste material in Source Area 2 by eliminating or greatly reducing the exposure routes of direct contact, ingestion, inhalation, food chain concentration, and migration to groundwater. Immobilization and containment of contaminants that have been identified as contributing to risk would result in overall protection of human health and the environment. All ARARs would be met including those pertaining to land disposal restrictions. Satisfaction of these threshold criteria dictates that the U.S. EPA conduct a rigorous detailed analysis of this remedy including a comparison to the incineration remedy.

Both the incineration remedy and the S/S remedy require the eventual land disposal of treatment residuals. PCBs and lead are the primary contaminants that contribute risks posed by Source Area 2 waste. Treatability study data and the design of the containment facility demonstrate that the S/S remedy would immobilize metal contaminants that contribute to risk, not result in risks from organic constituents that do not presently contribute to risk, and be effective in the long term. No evidence of the long-term effectiveness of the incineration remedy with respect to metals has been offered by the U.S. EPA. The S/S remedy represents the optimal extent to which permanent solutions and treatment technologies can be used in a cost-effective manner.

The U.S. EPA has not applied the NCP criteria in an evaluation of a comprehensive S/S remedy. It is the PRPs' belief that, had a comprehensive S/S remedy been evaluated based on all nine NCP criteria, the superiority of this remedy over the incineration remedy would be clear. The S/S remedy satisfies the threshold criteria and the balancing criteria described above. In comparison to the incineration remedy, the S/S remedy is far superior to the incineration remedy with respect to the remaining balancing and modifying criteria. It has fewer adverse short-term effects, is more implementable, can be completed more quickly at a significantly lower cost with less uncertainties, and would more easily meet with state and community acceptance.

C. U.S. EPA'S SELECTED REMEDY OF ON-SITE INCINERATION

The U.S. EPA Region III response document dated April 21, 1994 contained responses to issues concerning on-site incineration raised by the PRP's. The discussion in the response document is based on several memoranda (Rios, 1994; Rios, 1993; Kunz 1993; Edem, 1993; Flores 1993; Smith 1994; Oberacker 1993). The response document states that the PRP's issues concerning on-site incineration were "carefully considered" (Voltaggio, 1994, page 1) and concluded that the U.S. EPA's proposed on-site incineration remedy would be protective of human health and the environment.

The memoranda do not support the statement that the issues were given careful consideration nor do they support the conclusion that the proposed on-site incineration remedy would be protective. The analyses presented throughout the response document and the supporting memoranda are flawed because the responses 1) are based on methods that are in direct conflict with EPA guidance, 2) are based on approaches that are not conservative, and/or 3) do not respond directly to the issues raised. The following discussion presents a summary of the issue, the U.S. EPA Region III response, and direct comments on behalf of the PRP's demonstrating the flaws in the analyses.

ISSUE 1: The Remedial Design (RD) did not account for the risks posed by lead and other metals that would be emitted and transported downwind to receptors.

U.S. EPA RESPONSE: An operating scenario is possible that would require "stringent operating parameters and air pollution control device efficiencies ... in order to control the lead air emissions to levels that do not exceed" the NAAQS for lead, and that under that scenario (4 tph feed rate, 40 percent lead partitioning to flue gases, 95 percent control efficiency, no building downwash, and average lead concentration in the waste of 4,072 ppm) the ambient concentration of lead would be 0.949

micrograms per cubic meter. There are no more than 171 tons of lead in the materials.

COMMENT: U.S. EPA has misrepresented the data, has not adhered to its own guidance, and has made assumptions that are not protective in reaching its conclusions. U.S. EPA has not arrived at a conclusion that is supported by the data. Rather, it has manipulated the data and used unconventional approaches to arrive at its predetermined conclusions.

The risk assessment performed by U.S. EPA is a non-conservative estimate of risks for several reasons. First, only direct risks were considered. Indirect risks were ignored and are likely to be significant. Second, even the direct risks are underestimated because in the calculations leading to the ambient lead concentration of 0.949 micrograms per cubic meter, the U.S. EPA has made a series of assumptions that are not conservative, not consistent with its own guidance, and most importantly, not likely to occur. That scenario is based on a mischaracterized average lead concentration, on lead partitioning that is contrary to the data and contrary to U.S. EPA's own guidance, on air pollution control efficiency assumed to be more optimistic than U.S. EPA guidance allows, and on assumptions regarding air dispersion that are in conflict with the judgment of the U.S. EPA's own experts. Third, all four scenarios, including those with the incinerator operating at the depressed rate of 3 tons per hour, exceed the relevant BIF reference air concentration (RAC) of 0.09 micrograms per cubic meter. Fourth, the opinions of the U.S. EPA's own experts reflect their lack of confidence in the ability of the remedy to be protective of human health and the environment. For all of these reasons, the risk assessment does not succeed in demonstrating that the remedy will protect public health. Each of the above four points is explained in the following text.

1. Indirect Risks Will Be Important

Indirect exposures are especially important when contaminants are present that bioaccumulate or biomagnify, such as the arsenic, cadmium, lead, and PCBs in the Douglassville materials (DeBye, June 21, 1994). Significant exposure pathways would include ingestion of soils, crops, milk, fish, and surface water. Sensitive populations are present near the site, including elderly people and children with elevated blood lead levels. In Berks County, 265 children tested were found to have blood lead concentrations above 15 micrograms per deciliter, a concentration associated with low birth weight, permanent learning disabilities, and impaired neurobehavioral development (DeBye, June 20, 1994). Because of these sensitive populations, the increased risks due to the remedy, including indirect risks, should have been evaluated before the U.S. EPA made a commitment to the selected remedy.

2. Direct Risks Are Underestimated

The calculation that leads the U.S. EPA to the conclusion that lead emissions from the incinerator would be 0.949 $\mu g/m^3$ is based on assumptions that are contrary to U.S. EPA guidance and to the data. Those assumptions include: (1) the concentration of the lead in the waste; (2) the amount of lead that partitions to the flue gas; (3) the control efficiency of air pollution controls; (4) the modeling assumptions; and (5) the destruction of organics.

Lead Concentration in the Waste is Underestimated

The U.S. EPA characterized the lead concentration as the mean of selected samples equal to 4,072 ppm. Use of an average is contrary to U.S. EPA guidance. "Both 'average' concentrations and maximum concentrations are necessary to determine contaminant feed rates to be used in long-term and short-term health effects assessment" (EPA, 1992a, page 8). The Rios report acknowledges that "it is usually preferred that maximum soil concentrations be used," but their judgment was that "maximum soil concentrations did not represent a reasonable worst-case scenario under the present circumstances" (Rios, 1993, page 5). U.S. EPA provided no scientific basis or other justification for excluding the high measured concentrations from a calculation of a reasonable maximum average concentration, or 95 percent upper control limit on the mean value. The guidance and this report make the U.S. EPA's position clear that a reasonable worst case concentration should have been selected. Failure to do so makes U.S. EPA's analysis arbitrary and capricious.

The average concentration does not represent a reasonable worst-case, either. Use of an average condition, that would be an underestimate 50 percent of the time by definition, is not consistent with making a conservative estimate nor is it consistent with the requirements that the U.S. EPA would place on an environmental review of a new source. Therefore, it is capricious to analyze the impacts of this source using an average condition.

The U.S. EPA's own guidance requires calculating a confidence interval for the mean value of a concentration (U.S. EPA, May 1992, page 1). The guidance states that, "the 95 percent upper confidence limit of the arithmetic mean should be used" to represent the concentration in an exposure assessment. Based on a statistical analysis, the PRP's have calculated the 95 percent upper confidence limit for lead concentration to be 8,091 ppm. That value would represent a rational estimate of a reasonable worst-case scenario for the average lead concentration (Hawkins, 1994).

Lead Partitioning is Underestimated

The U.S. EPA emission rate calculation is based on the assumption that "40% of the lead will vaporize and enter the APCD." (Kunz, 1993, page 4). U.S. EPA guidance indicates that 100 percent of lead would partition to APCD (Kunz, 1993, page 3). The value of 40 was selected based on the treatability study results for "the recommended full scale operating conditions at 1,400°F at 30 to 45 minutes retention time" (Kunz, 1993, page 4). U.S. EPA guidance states that other partitioning factors based on test results from specific types of rotary kiln incinerators may be substituted where available (U.S. EPA, 1992a, p. 19). Assuming that the bench scale split tube furnace is one of those types, a simple average of the partitioning at the condition of interest is not a protective estimate of partitioning. A great amount of variability in the percent of lead retained in the ash was observed in the treatability study. A statistical analysis of the lead partitioning concludes that the average lead retention was 50 percent, and it would have a 95 percent confidence interval of 36 percent to 131 percent (Hawkins, 1994). If ash retention is assumed to be the inverse of partitioning, then the 95 percent upper confidence limit on partitioning would be 64 percent. (Equal to 100 percent minus 36 percent retained in the ash).

The presence of chlorine and other halogens has a known impact of increasing the volatility of lead. This presents additional support for selection of a reasonable maximum value for lead partitioning (Crate, 1994, page 5).

APCD Efficiency is Overestimated

The U.S. EPA analysis was conducted assuming that the air pollution control system would consist of a venturi scrubber with a pressure drop of 60 inches of water achieving a control efficiency of 90 and

95 percent for metals (Kunz, 1993, page 2,4). These efficiencies are contrary to U.S. EPA guidance. U.S. EPA guidance for a venturi scrubber with a pressure drop of 60 inches of water indicates a 40 percent control efficiency for lead (U.S. EPA, 1992a, page 22). This guidance is supported by research performed by U.S. EPA that reported lead capture efficiencies as low as 3 percent and not more than 84 percent by a wet (venturi) scrubber (U.S. EPA, 1993a, p. 57), including all test programs completed during the fiscal year. Furthermore, use of the 90 percent efficiency results in an ambient concentration of 1.89 micrograms per cubic meter in the no building downwash scenario and 4.4 micrograms per cubic meter in the building downwash scenario. Both of these scenarios exceed the NAAQS of 1.5 micrograms per cubic meter and the BIF RAC of 0.09 micrograms per cubic meter.

Modeling Assumptions Were Non-Protective

Stack Height. The stack height used in modeling was 20 m (Edem, 1993, page 2). U.S. EPA guidance provides default values to be used when actual stack parameters are not available (U.S. EPA, 1992a, p.13). In cases except for stack height, the stack parameters used were the default values specified by the guidance. The value of 20 m (65.6 ft) for stack height is 2.5 times the specified default value of 8 m (26.2 ft.). No scientific basis or other justification was provided for this departure from the guidance.

Building Downwash vs. No Building Downwash. U.S. EPA's own expert analysis concluded that "downwash was found to be important" (Edem, 1993, page 2). The scenario that considers downwash effects would produce an ambient concentration of 2.20 micrograms per cubic meter (Edem, 1993, Table 5), 50 percent over the NAAQS maximum concentration for lead. Reliance on the No Building Downwash scenario was contrary to the advice of U.S. EPA's own expert.

In conducting the direct risk evaluation, the U.S. EPA has arbitrarily selected a stack height contrary to their guidance and a dispersion scenario contrary to the judgment of their expert. The U.S. EPA has not been conservative in evaluating risks and these non-protective assumptions substantially underestimate the health risk.

Organic Destruction Efficiency is Overestimated

The emission rate estimates for PIC and organics were based on a "key assumption ... that a DRE of exactly 99.9999 percent will be achieved for all PCBs and THCs" (Kunz, 1993, page 2). According to the RD, the incinerator will only operate in a mode of 99.9999 percent DRE, when the PCB concentration (based on a sampling grid) is greater than 50 ppm PCBs (U.S. ACE, 1993 page 01700-8). Assuming that this will always be the mode of operation is not likely nor is it conservative. When the PCB concentration is less than 50 ppm, the required DRE would be 99.99 percent, resulting in an increase in PIC emissions by two orders of magnitude (100 times). Using the approach in the U.S. EPA's submittals, this would produce a THC (benzene) hazard index of 2.85 for the child residents and a total hazard index of 4.70 for child residents. The adult risk due to THC (benzene) would increase to 0.814, increasing the total adult hazard index to 1.34.

It was wrong for the U.S. EPA to assume a DRE of 99.9999 percent in its risk analysis. This was arbitrary and has the effect of underestimating the risk.

The above five assumptions used by the U.S. EPA individually and collectively lead to an underestimate of the risks represented by the U.S. EPA's direct exposure risk assessment.

3. Compliance with the NAAQS Is Not Good Enough

In its analysis, the U.S. EPA compared the ambient lead concentration due to the incinerator to the NAAQS. No attempt was made to add this to background levels, or to consider other contributors to ambient concentrations. The relevant reference concentration RAC for lead is 0.09 micrograms per cubic meter (BIF). None of the scenarios proposed by the U.S. EPA would meet that criteria (Edem, 1993, Tables 2-5).

4. U.S. EPA's Own Experts Do Not Have Confidence in the Ability of the Selected Remedy to be Protective of Human Health and the Environment.

Oberacker, 1993, page 3: "The basis of our confidence incineration for Douglassville's Source Area 2 material can be summarized as ... we certainly would like to see some pilot-scale treatability studies."

Flores, 1993, page 1: "PIC cannot be determined by predictive methods."

Smith, 1994, page 1: "Our recommendation to Region III ... for the Douglassville Disposal site is to assess risks for indirect pathways of exposure prior to full production operation."

ISSUE 2: Incineration technology is not demonstrated to be capable of complying with ARARs.

U.S. EPA RESPONSE: The RD has been "carefully designed and adjustments to control parameters can be made during the trial burn(s) in order to operate the on-site incinerator safely."

COMMENT: U.S. EPA's experts concur with the PRPs that important design parameters have not been determined (Oberacker, 1993, page 3; Flores, 1993, page 1; and Smith, 1994, page 1). The U.S. EPA suggests that these parameters can be defined in the trial burn, but the PRPs contention that this could only be accomplished at additional excessive expense has not been refuted.

In addition, no attempt was made to evaluate emissions of particulate matter, as required in U.S. EPA guidance (U.S. EPA, 1992a, page 25).

ISSUE 3: The total lead emissions would be in the range of 1,600 to 12,000 pounds over the life of the remedy or higher due to start-up inefficiencies.

U.S. EPA RESPONSE: The U.S. EPA does not agree.

COMMENT: The U.S. EPA does not agree, but fails to offer an alternative calculation. Based on the values the U.S. EPA cites elsewhere in its submittals, consisting of 171 tons of lead in the materials to be incinerated, 40 percent partitioning, and 95 percent control efficiency, the U.S. EPA values would indicate that 6,840 pounds of lead would be emitted. That is within the range that the U.S. EPA claims to disagree.

Using more appropriate input values that would be consistent with EPA guidance would result in over 250,000 pounds of lead emitted. EPA's calculation of 171 tons of lead in the material is based on the average concentration of 4,072 ppm. Using the reasonable maximum average value of 8,091 ppm (based on the 95 percent upper confidence interval), the total quantity of lead in the material would be 338 tons. Assuming 64 percent partitions to the flue gas (based on the 95 percent upper confidence interval) and that 40 percent is captured by the wet scrubber (based on guidance from U.S. EPA, 1992a, page 22), the result is that 130 tons, or over 250,000 pounds would be emitted.

ISSUE 4: The incinerator remedy conflicts with the spirit of the U.S. EPA's current incineration moratorium.

U.S. EPA RESPONSE: There is no moratorium on incineration at post-ROD CERCLA sites.

COMMENT: The strong message from the U.S. EPA Headquarters was that an Indirect Exposure Risk Assessment would be required before the Douglassville incinerator begins full production operation (Smith, 1994, page 1). Headquarters also indicated that the procedure for conducting indirect risk assessments is still evolving and is several months away from a working model.

Evolution of the final procedure and subsequent collection of one year of meteorological data (to support the indirect risk assessment) is likely to result in a delay of approximately 18 months, during which time the incinerator is sitting idle on-site (3 months to obtain trial burn results, collect 12 months of met data, 3 months to conduct risk assessment). That delay would cost $7.6 million at $14,000/day downtime, the daily burden rate quoted by an on-site incineration vendor for cold standby of a 20 ton per hour nominal capacity unit. The cost of delay due to conducting an assessment of indirect pathways was not included in the incineration cost represented in the ROD. Therefore, the U.S. EPA has been arbitrary by not considering significant cost components in the cost estimate for this remedy.

ISSUE 5: Incineration is not a preferred remedy for heavy metals contamination.

U.S. EPA RESPONSE: The ROD does not contemplate that metals will be remediated by on-site incineration. The remedy was selected in accordance with the NCP. The chosen remedy will permanently eliminate unstable organics and remaining metallic ash will be stabilized.

COMMENT: Although the U.S. EPA's proposed on-site incineration remedy may not remediate metals, it may not neglect the presence of metals, and must consider the impact that incineration may have on all contaminants of concern. The unavoidable emissions of lead, arsenic, cadmium, and chromium from an incinerator are of greater consequence than the potential risk of exposure to buried PCBs, making on-site incineration a poor remedy selection.

ISSUE 6: Incineration has created problems at other sites.

U.S. EPA RESPONSE: Peak Oil is not a good comparison because the incineration was performed under removal response authority. The trial burn analysis for Douglassville will be completed before the incinerator is allowed to become fully operational.

COMMENT: The track record for incineration is spotty at best. Peak Oil is one example. Others problem sites referenced include BROS, Motco, Vertac, Laskin Poplar, Bayou Bonfouca, and WTI. From a comprehensive list of on-site incineration clean-up sites published (Cudahy and Troxler, 1992), 17 had completed or attempted on-site incineration of a sludge matrix contaminated with semivolatile organics. Of these, approximately one-third have faced problems that led to costs greater than 150 percent of the original estimate. Costs at 200 percent of the ROD estimate were faced at several sites. The cost reached 400 percent of the original contracted cost at one site (Barr, August 1993, Appendix D and Havlik, 1994).

ISSUE 7: Given the chlorine content, it is clear that dioxin emissions would occur, causing a real carcinogenic risk exceeding the hypothetical risk of no-action.

U.S. EPA RESPONSE: The low chlorine content indicates that the possibility of the formation of dioxin is unlikely.

COMMENT: The U.S. EPA's apparent lack of concern for the quantity of PICs (such as dioxin and furan) formed and the associated risk is inconsistent with the draft guidance that expresses concern over PIC emissions even if they comprise only 1/50,000 (or 0.002 percent) of the hydrocarbon emitted from incinerators operating with a DRE of 99.9999. Furthermore, the strategy for applying the incineration moratorium to Superfund states that pollutants such as dioxins and furans may justify controls even more stringent than those in existing regulations (Laws, 1994, page 2).

ISSUE 8: Incineration turns a hypothetical exposure into real human health exposures by causing airborne releases.

U.S. EPA RESPONSE: The U.S. EPA assessments do not support the conclusion that on-site incineration poses a real human health risk.

COMMENT: The U.S. EPA has misquoted the issue as turning a hypothetical risk to real risk. Pathways are completed by incineration, creating real exposures.

ISSUE 9: Less that 1 percent difference in APC efficiency results in dramatic increases in metal emissions.

U.S. EPA RESPONSE: TRC used the PRP's lead concentration of 14,500 ppm rather than the U.S. EPA's value of 4,072 ppm. Using the value 4,072 ppm and 95 percent control efficiency, the incinerator would meet the NAAQS for lead and risks would not be significant.

COMMENT: Independent of the lead concentration, a control efficiency of 90 percent will result in twice the lead emissions of a unit operating at 95 percent. The unit operating at 95 percent will emit five times as much lead as a unit operating at 99 percent. Therefore, small changes in control efficiency will have a big impact on emissions. Because of the uncertainty in actual air pollution control efficiency, this issue is significant. U.S. EPA has a responsibility to perform a conservative analysis of the impacts of the remedy on public health. A responsible analysis would include a consideration of the uncertainty in parameters that have a strong bearing on the outcome. The range of possible air pollution control efficiencies has a large impact on lead emissions and a corresponding large impact on exposures and health risks.

ISSUE 10: The incineration remedy would not be able to meet the requirements of the BIF rule.

U.S. EPA RESPONSE: The BIF standards are not ARARs, but the RD specifications require the remedy to comply with BIF. The BIF regulations are based on an inhalation health risk. Based upon the direct exposure pathways, there do not appear to be any significant levels of risk associated with on-site incineration.

COMMENT: The U.S. EPA attempts to make a logical argument that fails to acknowledge that the BIF standards also established a reference air concentration (RAC) for lead of 0.09 micrograms per cubic meter (one-tenth of the proposed NAAQS for lead). All of the scenarios modeled by the U.S. EPA produce an ambient concentration greater than 0.09 micrograms per cubic meter. Therefore, these results support the conclusion that BIF would not be met (Tier III analysis).

BIF Tier I: feed rate (g/hr) (Assumes all metal fed is emitted)

BIF Tier II: emission rate (g/hr) (Uses emission testing to get credit for partitioning and APC efficiency)

BIF Tier III: ambient concentration ($\mu g/m^3$) (emission testing and modeling to demonstrate that actual measured emissions do not exceed acceptable levels considering actual predicted dispersion to the MEI)

The U.S. EPA has been capricious in failing to apply the BIF RAC of 0.09 micrograms per cubic meter to this hazardous waste incinerator. The modeling results demonstrated that it would not be met under any scenarios modeled. Therefore, the U.S. EPA has demonstrated that BIF would not be met. Failing to apply the BIF standard is in direct conflict with the current strategy for the moratorium on incineration as applied to post-ROD sites. That guidance states that pollutants such as toxic metals may require controls more stringent than those in existing regulations (Laws, 1994, page 2).

ISSUE 11: The operating conditions that would be necessary to achieve PCB destruction are in conflict with those conditions needed to minimize lead emissions.

U.S. EPA RESPONSE: The U.S. EPA believes that lead emissions will not exceed health based standards.

COMMENT: U.S. EPA refers to the Oberacker memorandum in expressing U.S. EPA's belief that a well-designed and operated incinerator should be capable of treating the waste. Yet Oberacker is clearly not convinced of that outcome based on available data, and indicates that pilot-scale treatability studies are needed to provide a basis for U.S. EPA's confidence.

ISSUE 12: The majority of the material that the U.S. EPA proposes to incinerate does not contribute to the risk.

U.S. EPA RESPONSE: The totality of the mixture constitutes the threat and requires remediation.

COMMENT: The incineration remedy was selected before the full extent of metals contamination was understood. The U.S. EPA needs to consider the totality of the direct and indirect risks produced by incineration of the totality of contaminants, including metals. The comparison of risks needs to consider the cost-effectiveness of incremental differences in risks associated with remediation alternatives.

ISSUE 13: The high Btu and metals content of the waste would substantially increase the cost and reduce the efficiency of the incinerator.

U.S. EPA RESPONSE: The cost was determined to be acceptable.

COMMENT: In the record of decision, the U.S. EPA estimated the cost of the remedy to be between $39 million and $53 million. The U.S. EPA has not addressed the fact that costs are likely to be much higher than ROD estimate. An evaluation comparing ROD estimates to actual costs for on-site incineration of sludges contaminated with semivolatile contaminants found that actual costs always exceed the ROD estimate (Barr, 1993, Appendix D). The study also found that actual costs were up to four times the cost estimated in the ROD, and a probability of 30 percent that the actual cost would exceed one and one-half times the cost estimated in the ROD.

ISSUE 14: The U.S. EPA's thermal treatability contained several fundamental flaws.

U.S. EPA RESPONSE: The study was not flawed, and that full-scale studies will be performed prior to implementation. The filter cake is not atypical and similar wastes have been successfully incinerated at other U.S. EPA sites.

COMMENT: The flaws of the treatability study have been documented and have not been refuted (Barr, August 1993, Appendix E). In addition to the basic flaws in approach, EPA made several significant errors in conducting the study and in analyzing the data that was generated by the study. A list of those errors is provided in Table 8. U.S. EPA continues to base its design parameters and assumptions on the results of that flawed study.

Important design parameters based on the flawed study include residence time, temperature, kiln size, and lead partitioning (Hawkins, 1994). The data developed by that flawed study are not sufficient to determine the viability of incineration for these materials (Crate, 1994, page 4).

We are not aware of many other sites that have successfully incinerated similar wastes. The Motco site, that U.S. EPA offers as an example of success, cannot be considered a success because the cost of the remedy has more than tripled from the original contract of $28 million to $100 million (Environment Today, June 1994). The Sikes site has been suggested to be an incineration success. However, the material is much different from the Douglassville material and would be easier to incinerate because it has a low average heat content of 2,000 Btu/lb. In addition, air pollution controls were not required to address lead emissions. Despite the fact that the Sikes material has favorable characteristics for incineration, the Sikes incinerator suffers from frequent upsets and uncontrolled releases.

The U.S. EPA indicates that the bench scale study was done for Douglassville to save the cost of a pilot scale test. When the cost impacts are as high as they are for incineration ($14,000 per day to have the incinerator sitting idle on-site), it is far better to spend appropriate resources on a careful and effective design.

SUMMARY

In producing the RI/FS, ROD, Thermal Treatability Testing Report, Final Design Analysis, and responses to the PRPs post-ROD submittals the U.S. EPA has committed numerous errors, omissions, misrepresentations, and other deficiencies. A summary of these issues is presented in Table 8. The vast majority of these issues result in: (1) an underestimation of the short- and long-term impacts of the on-site incineration remedy; (2) an inaccurate and unsubstantiated exaggeration of the concerns related to the S/S remedy;

(3) misrepresentation of information that the public and PADER would reasonably rely upon to make judgements about the remedial action issues; and (4) a general disregard for U.S. EPA guidance and the protection of human health and environment.

If you have any questions or comments concerning this information, please contact Rick Marton at (612) 832-2728 or me at (612) 832-2620.

Sincerely,

John P. Borovsky
Vice President

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TABLE 1

SUMMARY OF U.S. EPA's ANALYSIS OF LEAD CONCENTRATION DATA

FOR SOURCE AREA 2

MATERIAL DESCRIPTION	SAMPLE ID	LEAD CONCENTRATION REPORTED BY LABORATORY (mg/kg)	DATA QUALIFIER	DATA USED BY EPA TO CALCULATE AVERAGE (mg/kg)
Waste	TP-19/2FT	12.7	B	0
	TP-21/5FT	663	L	0
	TP-18/6FT	830	N	830
	TP-19/5FT	944	L	0
	TP-21/2FT	1150	L	0
	DUP-TP-221	1570	L	0
	TP-19/2FT	2200	N	2200
	TP-19/8FT	2200	N	2200
	TP-20/4FT	2200	N	2200
	TP-19/10FT	14600	L	0
Soil below waste	TP-21/15FT	22	L	0
	TP-21/10FT	25	L	0
	TP-19/15FT	36.9	L	0
	TP-19/20FT	137	L	0
Soil sample from pit not in the waste lagoon	TP-23/10FT	14	K	14
	TP-27/5FT	16	K	16
	TP-27/2FT	22	K	22
	TP-27/15FT	25	K	25
	TP-23/2FT	35	K	35
	TP-27/5FT	50	K	50
	TP-23/10FT	110	K	110
	All Samples Average Concentration	1279		367
	Waste only Average Concentration	2637		743

Data Qualifiers: B = detected in blank
K = value biased high
L = value may be biased low
N = no qualifier, valid result

TABLE 2

PHASE IV TCLP RESULTS, VOCs, FORMULATION 14

VOC	AVERAGE UNTREATED raw, µg/L	AVERAGE UNTREATED corr, µg/L	TREATED SAMPLES FOLLOWING A 42-DAY CURE TIME A µg/L	TREATED SAMPLES FOLLOWING A 42-DAY CURE TIME B µg/L	EFFECT	TREATED SAMPLES FOLLOWING A 443-DAY CURE TIME A µg/L	TREATED SAMPLES FOLLOWING A 443-DAY CURE TIME B µg/L	EFFECT	TCLP STANDARD µg/L	MCL µg/L
Benzene	19	10.64	7.8	6.6	R	4.4	3.9	R	500	5
2-Butanone (MEK)	38	21.28	60E	40E	I or U	180	170	I	200,000	-
Carbon Disulfide	0.9	0.50	3.3	<.14	R and I	<1.1	<1.1	U	-	-
Carbon Tetrachloride	2.6	1.46	<0.2	<0.2	R	<0.2	<0.2	R	500	5
Chloroform	4.1	2.30	0.8E	0.6E	R	2.7	2.5	I	6,000	100
1,1-Dichloroethane	1.2	0.67	<.15	<.15	R	<0.8	<0.8	U	-	-
1,2-Dichloroethane	8.1	4.54	<0.1	<0.1	R	<0.5	<0.5	R	500	5
1,2-Dichloropropane	1.3	0.73	<0.12	<0.12	R	<0.5	<0.5	R	-	5
Ethyl Benzene	21	11.76	13	9.7	R and I	7.5	6.8	R	-	700
2-Hexanone	5.6	3.14	12	<2.0	R and I	25	26	I	-	-
4-Methyl-2-pentanone (MIBK)	93	52.08	<2.0	<2.0	R	60	50	U	-	-
Tetrachloroethene	6.2	3.47	5.1	2.9	R and I	2.1	1.9	R	700	5
Toluene	86	48.16	190	43	R and I	26	23	R	-	1,000
1,1,1-Trichloroethane	16	8.96	4.1	2E	R	1.9	1.6	R	-	200
Trichloroethene	120	67.20	59	50	R	23	20	R	500	5
Vinyl Acetate	3.7	2.07	<0.14	<0.14	R	<0.8	<0.8	R	-	-
Xylenes, Total	110	61.60	43	36	R	39	36	R	-	10,000

Compounds were omitted from the VOC compound list if ALL values for untreated and treated samples yielded only "<" and "E" value.

AVERAGE UNTREATED VALUES:
"raw" is copied from Synopsis Report Table IV-4.
"corr" = corrected values. The corrected value is 56% of the raw value, correcting for dilution: 50 parts reagent + 30 parts water + 100 parts waste = treated mass comprised of 56% waste.

EFFECT: Measured by comparing treated value with CORRECTED untreated waste value.
"R" indicates reduction in leachability
"I" indicates increase in leachability
"U" indicates uncertainty because of estimated values or nearly identical results

MCL = Maximum Contaminant Level drinking water standard.

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TABLE 3

PHASE IV TCLP RESULTS, SVOCs, FORMULATION 14

VOC	AVERAGE UNTREATED raw, µg/L	AVERAGE UNTREATED corr, µg/L	TREATED SAMPLES FOLLOWING A 42-DAY CURE TIME A µg/L	TREATED SAMPLES FOLLOWING A 42-DAY CURE TIME B µg/L	EFFECT	TREATED SAMPLES FOLLOWING A 443-DAY CURE TIME A µg/L	TREATED SAMPLES FOLLOWING A 443-DAY CURE TIME B µg/L	EFFECT	TCLP STANDARD µg/L	MCL µg/L
Benzyl Alcohol	<0.3	<0.17	2.5	0.7E	I and U	3.4	4.1	I	-	-
Bis(2-chloroethyl)ether	5.9	3.30	1.5E	1.4E	R	<1.8	<1.7	R	-	-
Bis(2-ethylhexyl)phthalate	3.1	1.74	2.5	2.5	I	<1.8	<1.9	U	-	6
2-Chlorophenol	5.4	3.02	0.8E	0.6E	R	1.4	<15	R	-	-
di-n-Butylphthalate	<0.3	<0.17	4.7	5.9	I	<1.4	<15	U	-	-
1,2-Dichlorobenzene	<2.1	<1.18	2	2.2	I	3.2	3.4	I	-	600
2,4-Dimethylphenol	210	117.60	51	48	R	18	16	R	-	-
Isophorone	5.5	3.08	1.8	1.8	R	<1.8	<1.9	R	-	-
2-Methylnaphthalene	11	6.16	5.2	6.3	R and I	6.7	7	I	-	-
2-Methylphenol	<0.3	<0.17	27	23	I	13	14	I	-	-
4-Methylphenol	250	140.00	180	180	I	120	120	R	-	-
Naphthalene	24	13.44	12	14	U	17	18	I	-	-
Phenanthrene	0.8	0.45	0.3E	0.4E	U	<2.8	<2.9	U	-	-
Phenol	150	84.00	250	230	I	160	170	I	-	-

Compounds were omitted from the SVOC compound list if ALL values for untreated and treated samples yielded only "<" and "E" value.

AVERAGE UNTREATED VALUES:

"raw" is copied from Synopsis Report Table IV-5.

"corr" = corrected values. The corrected value is 56% of the raw value, correcting for dilution: 50 parts reagent + 30 parts water + 100 parts waste = treated mass comprised of 56% waste.

EFFECT: Measured by comparing treated value with CORRECTED untreated waste value.

"R" indicates reduction in leachability
"I" indicates increase in leachability
"U" indicates uncertainty because of estimated values or nearly identical results

MCL = Maximum Contaminant Level drinking water standard.

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TABLE 4

ORGANIC CONSTITUENTS SHOWING INCREASES, MIXED EFFECTS, OR UNCERTAIN EFFECTS WITH RESPECT TO TCLP LEACHABILITY

CONSTITUENT	SIGNIFICANCE OF TCLP RESULTS
2-Butanone (MEK)	All results were 3 orders of magnitude below TCLP criteria. Dismissed as insignificant during the baseline risk assessment.
Carbon Disulfide	Detected in only 1 of 4 treated samples near the detection limit.
Chloroform	Slight increase after 443 days. Concentrations at least 30x lower than MCL and 2000x lower than TCLP criteria.
1,1-Dichloroethane	Not detected in any treated samples although detection limit after 443 days was higher than concentration in untreated sample extract.
Ethyl Benzene	All concentrations were below the MCL. Both duplicates after 443 days showed reductions compared to untreated waste.
2-Hexanone	Detected in 3 of 4 samples near the detection limit. Detected in the Schuylkill River at the same concentration present in the highest concentration TCLP extract. Dismissed as insignificant in the baseline risk assessment.
4-Methyl-2-pentanone (MIBK)	Dismissed as insignificant in the baseline risk assessment. Samples after 42 days showed reductions. Samples after 443 days showed mixed effects.
Tetrachloroethene	3 of 4 results for treated samples were below the MCL; the fourth result was nearly equivalent to the MCL. Both duplicates after 443 days showed reductions compared to untreated waste.
Toluene	All concentrations were below the MCL. Both duplicates after 443 days showed reductions compared to untreated waste.
Benzyl Alcohol	All concentrations were near the detection limit.
Bis(2-ethylhexyl)phthalate	All concentrations were below the MCL. Not detected in either sample after 443 days although detection limit was higher than concentration in untreated sample extract.
di-n-Butylphthalate	Dismissed as insignificant in the baseline risk assessment. Not detected in either sample after 443 days although detection limit was higher than concentration in untreated sample extract.
1,2-Dichlorobenzene	All concentrations were below the MCL.
2-Methylnaphthalene	All concentrations were near the detection limit. All concentrations were lower than the average concentration in groundwater measured at the Site.
2-Methylphenol	Dismissed as insignificant in the baseline risk assessment.
4-Methylphenol	Dismissed as insignificant in the baseline risk assessment. Both duplicates after 443 days showed reductions compared to untreated waste.
Napthlalene	All concentrations were significantly lower than EPA's long term health advisory concentrations for drinking water.
Phenanthrene	Concentrations in samples after 42 days were near the detection limit. Not detected in either sample after 443 days although detection limit was higher than concentration in untreated sample extract.
Phenol	All concentrations were significantly lower than the Ambient Water Quality Criteria. Both duplicates after 443 days showed reductions compared to treated waste after 42 days.

TABLE 5

TCLP LEAD RESULTS
FORMULATION 14 (IWT-25 at 50%)

SAMPLE NUMBER	TESTING PHASE	CURE TIME (days)	TCLP LEAD (mg/L)
508I-1	I (untreated)	--	11
508I-2	I (untreated)	--	11
508I-3	I (untreated)	--	11
508II-14	II	14	2.0
508III-14A	III	14	<0.19
508III-14B	III	14	<0.19
508III-14C	III	14	<0.19
508IV-14A	IV	42	<0.019
508IV-14B	IV	42	<0.019
14FT-A	Freeze/Thaw	150	<0.019
14FT-A (Dup)	Freeze/Thaw	150	<0.019
14FT-B	Freeze/Thaw	150	<0.019
14FT-B (Dup)	Freeze/Thaw	150	<0.019
14WD-A	Wet/Dry	150	<0.019
14WD-A (Dup)	Wet/Dry	150	<0.019
14WD-B	Wet/Dry	150	<0.019
14WD-B (Dup)	Wet/Dry	150	<0.019
14 (Control-A)	Durability Extended Cure Control	150	<0.019
14 (Control-A) (Dup)	Durability Extended Cure Control	150	<0.019
14 (Control-B)	Durability Extended Cure Control	150	22
14 (Control-B) (Dup)	Durability Extended Cure Control	150	42
14-CT1-A	Durability Humid Control	150	9.2
14-CT1-B (Dup)	Durability Humid Control	150	8.3
14A-282	Extended Cure	282	<0.019
14B-282	Extended Cure	282	<0.019
14C-282	Extended Cure	282	<0.019
14A-443	Extended Cure	443	<0.031
14B-443	Extended Cure	443	<0.031

Dup - Represents analytical duplicates which were performed on material taken from the same sample jar as the original sample to confirm analytical methodologies.
TCLP limit (5 mg/L) failure rate for treated samples is 4 of 25 samples or 16% of all analyses.
TCLP limit failure rate for treated samples is 2 of 18, or 11% for individual sample jars.

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TABLE 6

SITES WITH ORGANIC CONTAMINATION
WHERE ON-SITE IMMOBILIZATION TREATMENT WAS THE SELECTED REMEDY

SITE NAME AND LOCATION	EPA REGION	WASTE PRODUCING OPERATIONS	WASTES/CONTAMINANTS	STATUS	COMMENTS
Sullivan's Ledge Bedford, MA	1	Hazardous materials and industrial waste disposal	Contaminated Soil and sediment: PCBs, PAHs, and lead	Remedial action scheduled for 1994	Superfund Site, 1989 ROD [1]
PSC Resources Palmer, MA	1	Waste oil and solvent storage and reclamation	Contaminated Soil and Sediment: PCBs, TOC (10%), VOCs, and Lead	Ongoing negotiations between EPA and PRPs	Superfund Site, 1992 ROD
York Oil Company, Franklin County, NY	2	Waste oil recycling	Contaminated soil and sediment: up to 20% TPH, PCBs, VOCs, phenols, and lead	Ongoing negotiations between EPA and PRPs regarding remedial design	Superfund Site, 1988 ROD[3]
Chemical Control Elizabeth, NJ	2	Hazardous waste TSD facility	Contaminated soil: PCBs, VOCs, pesticides, and metals	Unknown	Superfund Site, 1987 ROD [2]
Paoli Railyard Paoli, PA	3	Railyard facility	Contaminated soil and sediment: PCBs	Remedial design scheduled to begin in 1994	Superfund Site, 1992 ROD
Craig Farm Drum Armstrong County, PA	3	Chemical manufacturing	Contaminated soil: 6% TPH, VOCs, phenols, resorcinol, lead, and chromium	Remediation ongoing	Superfund Site, 1989 ROD
Bruin Lagoon Bruin Borough, PA	3	Production of mineral oil	Contaminated acidic sludge and soil: oils and inorganics	Remediation completed	Superfund Site, 1986 ROD
Sand Springs Petrochemical, OK	4	Oil Refinery, solvent recycling	Oily waste: TPH (16-24%),VOCs, SVOCs, metals	Mobilizing to conduct full-scale treatment	Superfund Site, 1987 ROD (later amended)
Mowbray Engineering Greenville, AL	4	Transformer repair	Contaminated soil: PCBs	Remediation completed	Superfund Site, 1986 ROD [4]
Pepper's Steel and Alloy Medley, FL	4	Manufacturing	Contaminated soil: PCBs, oil & grease, lead, and arsenic	Remediation completed	Superfund Site, 1986 ROD [5]
Pepper's Steel and Alloy Medley, FL	4	Transformer storage and salvage	Contaminated soil: PCBs, halogenated organics, PAHs	Ongoing negotiations between EPA and PRPs regarding remedial design	Superfund Site, 1990 ROD
Chemtronics Buncombe County, NC	4	Active waste disposal facility	Contaminated soil: VOCs, pesticides, arsenic, cyanide, and explosives	Unknown	Superfund Site, 1989 ROD

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TABLE 6 (Cont.)

SITES WITH ORGANIC CONTAMINATION
WHERE ON-SITE IMMOBILIZATION TREATMENT WAS THE SELECTED REMEDY

SITE NAME AND LOCATION	EPA REGION	WASTE PRODUCING OPERATIONS	WASTES/CONTAMINANTS	STATUS	COMMENTS
Commercial Oil Services Oregon, Ohio	5	Waste oil and solvent rerefining	Contaminated sludge: TPH (30%), VOCs, SVOCs	Developing Removal Action Design	EPA Removal Program Site
Amoco Whiting, IN	5	Oil refinery	oil, PCBs, lead, and chromium	remediation completed	State Site
GM Lagoons Bay City, MI	5	Automobile manufacturing	PCBs and oil	Remediation completed	State Site
CWM/Old Vickery, OH	5	Deep well injection facility, disposal lagoons	Contaminated sludge and soil: oil, PCBs, VOCs, SVOCs, and metals	Remediation completed	RCRA Facility
Velsicol Chemical, IL	5	Production and disposal of petroleum derivatives	Contaminated soil and sediment: VOCs, PAHs, and pesticides	Remediation completed	Superfund Site, 1988 ROD
Liquid Disposal Utica, MI	5	Commercial Incinerator	Contaminated soil and waste: PCBs, VOCs, SVOCs, metals	Remedial action to be completed by 1995	Superfund Site, 1987 ROD
NICOR Bell Chase, LA	6	Natural gas facility and barge cleaning	Oily waste (10-30%)	Currently ongoing	
Industrial Waste Control AR	6	Abandoned coal strip mine and landfill	Contaminated soil and sediment: VOCs and metals	Remediation completed	Superfund Site, 1988 ROD
Mid-South Wood Products Polk County, AR	6	Wood treating	Contaminated soil and sediments: PAHs, PCP, metals	Unknown	Superfund Site, 1990 ROD
Gurley Pit Edmonton, AR	6	Oil re-refining	Contaminated sludge and soil: oil, PCBs, lead, barium and zinc	Remediation completed	Superfund Site, 1986 ROD
John's Sludge Pond Wichita, Kansas	7	Waste oil recycling	Contaminated sludge and soil: oil, PCBs, lead	Remediation completed	Superfund Site, 1989 ROD; Completed 5-year review
Chemplex Clinton, Iowa	7	Landfill for plastics manufacturing	Contaminated sludge and soil: VOCs and PAHs	unknown	Superfund Site, 1989 ROD
Mittelhauser West Oakland, CA	9	Rail yard	Contaminated sludge: oil and lead	remediation completed	State Site
McColl Fullerton, CA	9	Aviation fuel production	Acidic sludge: VOCs, SVOCs, arsenic	Pilot demo ongoing	Superfund Site, 1984 ROD

TABLE 6 (Cont.)

SITES WITH ORGANIC CONTAMINATION
WHERE ON-SITE IMMOBILIZATION TREATMENT WAS THE SELECTED REMEDY

SITE NAME AND LOCATION	EPA REGION	WASTE PRODUCING OPERATIONS	WASTES/CONTAMINANTS	STATUS	COMMENTS
Purity Oil Sales Malaga, CA	9	Waste oil recycling	Contaminated sludge and soil: PCBs, PAHs, pesticides, phenols, and lead	Unknown	Superfund Site, 1989 ROD
Selma Wood Preserving Selma, CA	9	Wood preserving activities	Contaminated soil: pentachlorophenol, arsenic, and chromium	remediation completed	Superfund Site, 1988 ROD
Commencement Bay/ Tacoma Tar Pits, WA	10	Coal gasification	Contaminated soil: PCBs, VOCs, PAHs, and lead	Remediation 80% completed	Superfund Site, 1987 ROD [8]

[1]Sullivan's Ledge: Remedy selected over incineration because reduction in mobility is equivalent to incineration. Remedy is cost-effective and effective in long-term.
[2]Chemical Control: Incineration was not selected because incineration is more expensive and does little more to reduce risks.
[3]York Oil: Incineration was not selected because stabilization of residual ash would be required, and high lead emissions would result.
[4]Mowbray: ROD allowed incineration or immobilization. Regional coordinator selected immobilization because incineration operating parameters made the technology impractical.
[5]Pepper's Steel: Incineration was not selected because of serious environmental disadvantages, complexity of waste, time cost, and materials handling.
[6]Liquid Disposal: Incineration was not selected because of cost effectiveness.
[7]Gurley Pit: Incineration was not selected because of large increase in cost for a small gain in containment. Transportation of waste to an incinerator would increase the risk to the public.
[8]Commencement Bay: Incineration was not selected because of high cost.

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TABLE 7

PERFORMANCE STANDARDS FOR SITES WITH ORGANIC CONTAMINATION WHERE ON-SITE IMMOBILIZATION TREATMENT WAS THE SELECTED REMEDY

SITE	PERFORMANCE CRITERIA	
	MAXIMUM TCLP LEVELS	MINIMUM UNCONFINED COMPRESSIVE STRENGTH
Sand Springs	Levels based on 40 CFR 268.41, Table for Constituent Concentrations in (listed) Waste Extracts. These levels, which are lower than levels listed in 40 CFR 261.24 for the toxicity characteristic, would be met by treated Douglassville waste.	25 psi
Commercial Oil Services	Levels based on 40 CFR 261.24 for the toxicity characteristic.	20 psi
McColl	Unknown.	20 psi after 112 days
Selma Wood Preserving	Level for arsenic set at and levels for chromium and pentachlorophenol set below levels listed in 40 CFR 261.24. These levels would be met by treated Douglassville waste.	100 psi
Chemplex	Level for benzene set at level listed in 40 CFR 261.24. Levels for other constituents not listed in 40 CFR 261.24 would be met by treated Douglassville waste.	50 psi
Mittelhauser	Extracts using a procedure similar to TCLP must pass the California Soluble Threshold Concentrations. These levels would be met by treated Douglassville waste.	30 psi after 14 days and 50 psi after 28 days

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TABLE 8

SUMMARY OF U.S. EPA ERRORS, OMISSIONS, AND MISREPRESENTATIONS AND THEIR IMPACTS

ISSUE	ERRORS, OMISSIONS, AND MISREPRESENTATIONS	IMPACT
WASTE CHARACTERIZATION		
Lead content of Source Area 2 materials in RI/FS and ROD	Arbitrarily substituted a value of zero for observed laboratory data	Underestimates true average lead concentration
Lead content of Source Area 2 materials as characterized in EPA's response to PRP submittals	Failed to consider data variability in estimating average concentration of lead	Underestimates lead concentration
VOC content of Source Area 2 materials in RI/FS and ROD	Average concentrations are dramatically lower then reported in Design Document	Misinformed public as to potential for dioxin and furan incinerator emissions
PRP's observation of up to 36,000 ppm lead in filter cake	EPA arbitrarily deleted value as an "outlier" in calculating average lead concentration	Underestimates lead concentration, underestimates lead emissions
STABILIZATION/SOLIDIFICATION		
Lead content of the Source Area 2 materials reported in RI/FS	Mischaracterization of average lead content	Failure to recognize lead as primary contaminant in evaluating S/S performance
Petroleum hydrocarbon content of the waste	Reliance on arbitrary maximum for S/S applicability of 10% TPH	Arbitrary screening out of S/S technologies
Treatability testing in EPA's predesign work	Failure to test more than one process option	Arbitrary screening out of S/S technologies
Strength of the treated waste in PRP's treatability study	Incorrectly interpreted results as indicating reduced strength over time and applied arbitrary standard	Failure to accurately assess long-term effectiveness and permanence
TCLP concentrations of organic constituents in PRP's treatability study	Misrepresented significance of the data and impact on risk	Failure to accurately assess protection of human health and environment
Corrective Action Management Unit rule as an ARAR	Misrepresented that treated samples would fail RCRA limits for TCLP and not satisfy the ARAR	Failure to accurately assess compliance with ARARs
Floodplain management directives as an ARAR	Misrepresented that the treated waste would be placed inside the floodplain	Failure to accurately assess compliance with ARARs
Total waste analysis results for VOCs and PAHs	Misrepresented significance of the data and impact on risk	Failure to accurately assess long-term effectiveness and permanence
TCLP concentrations of calcium and magnesium	Misrepresented significance of the data and impact on durability	Failure to accurately assess long-term effectiveness and permanence
Arrowhead Refinery Site	Misrepresented that Barr recommended S/S remedy for the source material	Errant conclusion regarding applicability of S/S for similar waste
Sand Springs Site and other similar sites	Misrepresented TPH content of Sand Springs waste and appropriateness of comparing this and other sites with the Douglassville Site	Wrong conclusion regarding success of S/S technology at other sites

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TABLE 8 (Continued)

SUMMARY OF EPA ERRORS, OMISSIONS, AND MISREPRESENTATIONS AND THEIR IMPACTS

ISSUE	ERRORS, OMISSIONS, AND MISREPRESENTATIONS	IMPACT
INCINERATION REMEDY TREATABILITY STUDY AND DESIGN		
Scale of treatability study	Bench scale	Inconsistent with guidance; not sufficient as a basis for remedial design
Calculation of lead remaining in ash	Value for Run No. C/1400/45 in Table 4-10 is in error. Reported value is 91.4%. Correct value is 69.2%	Underestimates lead emissions
Calculation of lead remaining in ash	Value for Run No. A/1600/45 in Table 4-10 is in error. Reported value is 16.7%. Correct value is 20.6%	Overestimates lead emissions
Calculation of lead remaining in ash	Identification of Run No. C/1200/30 QC in Table 4-10 was arbitrarily changed from C/1600/30-1 because data resembled that for a low temperature burn, not a 1600° burn	Falsely improves data quality analysis; under estimates lead emissions
Sample preparation	Thoroughly homogenized the sample and removed particles greater than 1/2 inch in diameter	Biased the results; underestimates the residence time and temperature requirements
Interpretation of Thermal Treatability Study Results	Failed to conduct a statistical analysis of the data, thereby erroneously neglected the wide sample to sample variability in partitioning	Underestimates lead emissions
Partitioning	Assumed 40% of the lead in the waste would volatilize	Contrary to EPA guidance; underestimates lead emissions
Efficiency of air pollution controls	Assumed 95%	Contrary to EPA guidance; underestimates lead emissions
Stack Height	Assumed 20 m (65.6 ft)	Contrary to EPA guidance; underestimates air concentration at MEI
Importance of Building Downwash	Omitted EPA expert's opinion that downwash would be important and reported on the scenario that neglected downwash	Contrary to EPA's expert's analysis; underestimates air concentration at MEI
Organic Destruction Efficiency	Incorrectly assumed 99.9999% DRE for all PCBs and hydrocarbons, even though design documents allow 99.99% when PCBs are less than 50 ppm	Underestimates emissions of hydrocarbons and PIC
Allowable ambient concentration for lead	Omitted the BIF RAC for lead of 0.09 $\mu g/m^3$; erroneously presumed that compliance with NAAQS for lead would be adequate	Misrepresents ability to meet requirements

TABLE 8 (Continued)

SUMMARY OF EPA ERRORS, OMISSIONS, AND MISREPRESENTATIONS AND THEIR IMPACTS

ISSUE	ERRORS, OMISSIONS, AND MISREPRESENTATIONS	IMPACT
Need for pilot scale testing	Assume trial burn will be adequate	Omits EPA expert opinions that a pilot test is advised
Total lead emissions would be in the range of 1,600 to 12,000 pounds or higher	EPA disagrees, but does not offer an alternate estimate or range.	Using values EPA cited in its documents, 6,840 pounds of lead would be emitted. (Based on 171 tons of lead in the waste, 40% partitioning, and 95% control efficiency.)
INCINERATION REMEDY RISK ASSESSMENT		
Single exposure pathway	Air inhalation pathway is not the most significant pathway of concern	Significantly underestimates risk
PICs not identified	Potential PICs (Dioxins/furans, PAHs) were not included in the risk assessment	Significantly underestimates risk
Carcinogenic and chronic toxicity data	Toxic effects such as genotoxic, developmental and immunosuppressive effects were not evaluated	Significantly underestimates risk
Use of Arithmetic mean of contaminants	Upper confidence limit of the data set as well as maximum soil concentration should have been used	Significantly underestimates risk
Upset conditions, fugitive emissions and accidents	Upset conditions, non-steady state conditions, fugitive emissions, sudden releases due to accidents were not evaluated	Significantly underestimates risk
Environmental impact	The risk assessment did not evaluate incinerator emission impact on the environment	Significantly underestimates risk
Maximum Exposed Individual (MEI)	Sensitive population subgroups (i.e., day car centers, schools, nursing homes, infants, etc.) were not evaluated	Significantly underestimates risk
NAAQS for lead	Modeled lead in air concentrations were compared to ambient air quality standards rather than evaluated through use of the IEUBK model	Underestimates risk
TOHC represented by benzene	More detailed analysis of TOHC should identify other TOHCs expected to be emitted	May under/over estimate risk

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ATTACHMENTS

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May 18, 1994

Mr John Borovsky
Barr Engineering
8300 Norman Center Drive
Minneapolis
MN 55437–1026

Dear Mr Borovsky:

Douglassville waste treatment data

I have looked at two aspects of the data on the issue of treatment of the Douglassville waste – (i) the question of the *in situ* lead concentration of the filter cake; and (ii) the interpretation of the results of the tests carried out by the Corps of Engineers on possible incineration of the waste, particularly as regards the amount of lead that would not be entrapped in the ash but would be volatilized possibly released into the atmosphere.

1. The *in situ* lead concentration.

In this part of my analysis, I aimed to determine the likely range of values of the true mean lead concentration of the filter cake in the waste pile. This objective goes beyond the question of the best estimate of the mean by asking the further question of how much uncertainty there is in the estimate of the mean, and how high or how low the overall mean lead concentration of the filter cake could be, consistent with the assay data.

There were several distinct sources of data on the lead concentration of the filter cake. The RI/FS and TAMS exercises by the EPA provided the assays on a number of samples, and further sampling by Barr Engineering provided a further collection of samples and resultant assays.

I have taken the assays as you supplied them to me and have not verified them back to the original source documents. These assays are appended as Table 1.

Two different variants of the data seem to have been analyzed in the discussion so far. I carried out re–analyses of both. The data sets are referred to later as:–

EPA_26: This is the set of 26 assays (21 from EPA and 5 from Barr Engineering) discussed in the memo of March 9 by Mr Victor J Janosik.

EPA_24: This is the same data set after removal of two values.

I started the analysis with the 'EPA–26' data set. Using this data set to most effectively estimate the mean lead concentration of the whole pile requires that we first determine what the statistical distribution of the lead assays is. General experience with low–concentration analytes is that they follow a log–normal distribution – in other words, that the logarithms of their assays follow a normal distribution. To check this, I found the logarithms of the 26 original assays and made a normal probability plot of them. This is attached as Figure 1. The Wilk–Shapiro test is an accepted test of normality. The data set shows a Wilk–Shapiro test statistic of 0.960. The tables of Weisberg (1989) p 57 show that this value is well above the threshold at which one might conclude that the sample of log–transformed lead assays is non–normal. This indicates that the full set of 26 assays is consistent with a log–normal distribution.

Are there any outliers in the data? This leads to the next question of whether the data set contains any outliers. Outliers are defined (see for example Hawkins 1980) as values so far from the remainder of the data that they can not plausibly be considered part of the same population as the rest of the data. A graphical indication of an outlier might be a point projecting far to the right or left of the normal probability plot but a better formal test is the 'externally studentized residual' statistic. As discussed in Chapter 3 of Hawkins (1980), this is the optimal test statistic for a single outlier, and its sequential application provides likelihood ratio tests for multiple outliers.

I tested the largest and smallest values using the externally studentized residual statistic. The value of 36,000 has a P value of about 20% when tested as an outlier. The other observation deleted from the EPA_24 data set has an even larger outlier P value. Standard statistical practice uses hypothesis tests at significance levels 5% or lower, so there appears to be no sound statistical basis for regarding either of these observations as an outlier, and therefore no statistically well–founded grounds for deleting either of them from the data as outliers.

Setting a confidence interval for the true mean. Land (1971) set out the methodology for finding a confidence interval for the mean of log–normally distributed data. This same technology is recommended in the EPA document 'Supplemental Guidance to RAGS: Calculating the Concentration Term'. This technology uses the mean and standard deviation of the logarithmically–transformed assay data to provide the range of plausible values for the overall mean concentration of the analyte. I used this technology to calculate both an upper and a lower limit on the mean lead concentration of the filter cake. Both confidence limits are one–sided 95% limits (consistent with the EPA guidance document). If we were to use both together they would provide a two–sided 90% confidence interval.

The resulting confidence limits for the mean concentration based on each of the data sets is as follows. The table shows for each data collection the sample size, the assays' log–scale arithmetic mean, their log–scale standard deviation, the lower 95% confidence limit, and the upper 95% confidence limit.

Upper 95% confidence limit and
lower 95% confidence limit, Douglassville in situ Pb

TESTD	SIZE	LOGAVE	LOGSD	LOWER LIMIT	UPPER LIMIT
EPA_26	26	7.9685	1.0192	3382	8091
EPA_24	24	7.9332	0.8537	2961	6076

Note in particular that the full data set and the data set with the two observations removed provide upper 95% confidence limits of 8,091 ppm and 6,076 ppm respectively.

The EPA guidance document referenced above warns against using point estimates of the concentrations of hazardous substances as these make no allowance for the statistical uncertainties inherent in inferences from a modest number of samples to the population they attempt to characterize. Instead it states that EPA's mandate to protect human health and the environment motivates using upper 95% confidence limits as the working values of the mean levels of hazardous substances. Upper confidence limits provide conservative estimates of the levels of the hazardous substances and are therefore a more prudent basis for the assessment of risk than are point estimates of the mean.

If this reasoning by EPA is accepted, then the mean level of lead in the filter cake should not be taken as the point estimates used in previous discussion, but these upper confidence limits. In view of the good fit of the whole EPA_26 data set to the lognormal distribution, I therefore believe the appropriate conservative estimate of lead concentration to be 8,091 ppm.

2. The statistical analysis of the waste treatability study.

A study by the US Army Corps of Engineers investigated the consequences of incinerating the waste. The experiment focused on three different incineration temperatures, 1200°, 1400° and 1600°, and three incineration times, 15 mins, 30 mins and 45 mins. Composites of the waste were prepared from three different areas of the pile, called area A, area B and area C. Three additional runs were performed at 500° but these did not cover the full range of experimental conditions, so I removed these 500° samples from the data I analyzed, having first verified that their removal does not materially change the conclusions. The remaining data constitute a 3×3×3 factorial layout.

Each experimental run consisted of incinerating a weighed portion of the waste. Relevant to our purposes, the ash was weighed and assayed for lead. The weight and assay gave a figure for the lead remaining in the ash. A separate assay of some untreated waste samples from the A, B and C areas provided estimates of the mean lead concentration in the filter cake in each of these areas. This mean and the starting weight of each specimen therefore gave an estimate of the lead in each specimen prior to incineration. From these two figures of the lead content before incineration and the lead content of the ash, a 'percentage lead remaining' was calculated.

I have a number of reservations about this 'percentage lead remaining' figure. Gy (1982) provides an overview of the careful methodology needed when subsampling solid materials to ensure that the final experimental portions provide an unbiased picture of the original material. It is not clear to me from scanning the report that these methodological precepts were followed in arriving at the experimental portions incinerated. I am not clear on the reasons for the quite different starting weights of material used in the different runs, and note some statistical evidence that the results may be affected by the starting weight of material used. Furthermore, the A, B and C averages used to establish the baseline for the percentage remaining were based on small sample numbers and so contain appreciable statistical uncertainty – I will comment on this further later on. The conclusions reached on the retention of lead from the experimental data therefore need to be viewed with some circumspection.

Taking the retention data at face value for the moment, the overall experimental design gives a standard 3×3×3 factorial design. I performed the usual statistical analysis of this (see for exam Montgomery 1994). The statistical package STATISTIX v4.0 (Analytical Software) gave th following output:– (RUND refers to the three A B C areas; TEMP to incineration temperature, and TIME to incineration time. PBREM is the estimated percentage of the initial lead that remains in the ash after incineration.

ANALYSIS OF VARIANCE TABLE FOR PBREM

SOURCE	DF	SS	MS	F	P
RUND (A)	2	10246.1	5123.07	142.34	0.0000
TEMP (B)	2	10300.1	5150.04	143.09	0.0000
TIME (C)	2	1.64667	0.82333	0.02	0.9774
A*B	4	3124.60	781.149	21.70	0.0002
A*C	4	373.338	93.3344	2.59	0.1171
B*C	4	238.253	59.5633	1.65	0.2521
A*B*C	8	287.942	35.9928		
TOTAL	26	24572.0			
GRAND AVERAGE	1	64152.6			

The incineration time seems to have no impact on the lead retention. This appears to indicate that that even the shortest incineration time is long enough to liberate all lead that is going to liberated at each of the temperatures. Removing all the terms involving time from this analysis gives the following more compact analysis of variance table:–

ANALYSIS OF VARIANCE TABLE FOR PBREM

SOURCE	DF	SS	MS	F	P
RUND (A)	2	10246.1	5123.07	102.33	0.0000
TEMP (B)	2	10300.1	5150.04	102.87	0.0000
A*B	4	3124.60	781.149	15.60	0.0000
TIME (C) A*B*C	18	901.180	50.0656		
TOTAL	26	24572.0			
GRAND AVERAGE	1	64152.6			

This confirms two features noted in the Corps report – that there are overall differences in lead recovery between the three areas, and that there are overall differences in lead recovery between the three temperatures. However it also shows another disturbing feature not mentioned in the report – a highly significant interaction between RUND and TEMP. The presence of this interaction means that the material from the three subareas reacts to different temperatures differently. This is sho numerically in the following table of the lead remaining percentages broken down by RUND and TEMP. The table shows the average and standard deviation of the data, and also the 95% confidence interval for the individual RUND/TEMP combinations.

	TEMP	RUND	NO	MEAN	S.D.	LCL	UCL
	12	a	3	62.50	8.14	42.28	82.72
	12	b	3	40.53	1.70	36.30	44.76
	12	c	3	110.43	8.41	89.55	131.31
TEMP	12		9	71.156	31.516		
	14	a	3	38.30	2.43	32.27	44.33
	14	b	3	30.33	0.81	28.33	32.34
	14	c	3	85.93	11.34	57.79	114.08
TEMP	14		9	51.522	26.678		
	16	a	3	17.83	1.55	13.98	21.68
	16	b	3	21.70	12.84	-10.18	53.58
	16	c	3	31.13	2.87	24.00	38.27
TEMP	16		9	23.556	8.888		
OVERALL			27	48.744	30.742		

The average lead remaining figures range from a low of 18% to a high of 110% (a violation of the physical laws of conservation of mass that serves as a reminder of the statistical variability present in the data).

It is generally accepted that the main effects in an analysis of variance that has a large interaction are of limited value, and that one needs to look at the individual treatment combinations. I looked in more detail at the proposal to incinerate the filter cake at 1200°. I split out the data on lead retention at 1200° and did a one-way analysis of variance by RUND. This gave the following:–

ONE-WAY AOV FOR PBREM BY RUND

SOURCE	DF	SS	MS	F	P
BETWEEN	2	7666.15	3833.07	82.16	0.0000
WITHIN	6	279.913	46.6522		
TOTAL	8	7946.06			

COMPONENT OF VARIANCE FOR BETWEEN GROUPS 1262.14
EFFECTIVE CELL SIZE 3.0

The lead remaining in ash differs very strongly by subarea within the pile. It is a reported (but physically impossible) 110% for the subarea C material, and a more modest 62% and 41% in subareas A and B respectively. While the overall average retention is 71%, this overall average figure hides a large variability between the subareas. This creates the worrying potential for a scenario that if the pile were incinerated, while some parts would have high and safe lead reten in the ash, others would have low lead retention possibly leading to the emission of large amounts lead into the atmosphere.

This spatial variability can be assessed using the 'random effects' statistical model. Under this, the variability of the lead retention breaks down into two components:–

> The 'error' component, measuring the random variability inherent in the measurement; and
>
> The 'subarea' component, measuring the variability in the mean retention from one subarea to another.

These variance components are estimated as

> Error: 47
>
> Between subareas: 1262.

Under a normal distribution, this latter figure would imply that as you went from one portion of the pile to another, the *average* lead retention would undergo swings with a standard deviation of 35%. I would question the wisdom of planning on a single average figure for the lead retention without any allowance for variability in the retention.

I mentioned the problem of using a common denominator for all the data on lead retention from each subarea. This additional source of variability has been ignored in my calculation, but would have some implications. One is that taking it into account would somewhat reduce the 'between subarea' variance. A compensating effect though is that had the starting amount of lead been computed directly by assays of split samples from each run, the random variability would have approximately doubled. The common denominator does not have any bearing on the interaction between RUND and TEMP – this could not be caused by the denominators used, and so appears to be an inherent property of the pile.

As it is outside my area of expertise, I will not comment on the issue of how well results from a desk–top–sized pilot plant would scale up to a full–scale plant, but believe this is an area that should be looked at closely by someone who is an expert in this area.

In summary, I believe that prudent, conservative methods applied to the data on the lead *in situ* and the lead retention in the ash following incineration should consider the real possibilities that the actual lead content is a lot higher than the point estimate currently being used; and that the lead retention in incineration is likely to be far below the current design figure in large subareas of filter cake pile. Putting these individually unpleasant possibilities together raises the question of what guarantees there are against large emissions of lead into the atmosphere if the pile were to be incinerated.

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Sincerely yours

Douglas Hawkins

Douglas M Hawkins

Table 1.

Assay data on lead in filter cake with source indicated.

CASE	TEST	LEAD ppm	LNLEAD
1	bj92	4900	8.49699
2	bj92	36000	10.49127
3	bj92	2600	7.86327
4	bioc	5500	8.61250
5	bioc	3500	8.16052
6	rifs	944	6.85013
7	rifs	2160	7.67786
8	rifs	14600	9.58878
9	tank	832	6.72383
10	tank	891	6.79234
11	tank	1570	7.35883
12	tams	2690	7.89730
13	tams	3090	8.03593
14	tams	894	6.79571
15	tams	7990	8.98595
16	tams	2790	7.93380
17	tams	17100	9.74683
18	tams	1750	7.46737
19	tams	1660	7.41457
20	tams	2810	7.94094
21	tams	540	6.29157
22	tams	9560	9.16534
23	tams	1360	7.21524
24	tams	4450	8.40066
25	tams	2920	7.97934
26	tams	1470	7.29302

BARR ENGINEERING CO.

MEMORANDUM

TO: Douglassville Project File

FROM: Wayne Mattsfield (WRM)

SUBJECT: Results for Alternate Preparation/Digestion Procedures for Analysis of Filter Cake Waste for Lead

DATE: April 28, 1994

During various studies of untreated waste from Source Area 2 of the Douglassville Disposal Site, total lead concentrations have been reported ranging from less than 500 mg/kg to 36,000 mg/kg (3.6 percent). Total lead and TCLP lead concentrations reported for waste samples that were treated by thermal and biological treatment technologies increased over concentrations reported for untreated samples collected from the same bulk samples used in the treatment processes.

Several factors may have contributed to increases in reported total lead and TCLP lead concentrations after treatment when typical CLP or SW-846 digestion/extraction procedures were used for the analyses. These factors include, but are probably not limited to, the following:

1. The waste contains up to 35 percent to 50 percent oil and grease. This may interfere with the effectiveness of routine extraction procedures that use nitric acid for total waste digestion and acetic acid for TCLP leaching. Thermal and biological treatment may reduce the concentration and character of these interfering hydrocarbons by volatilization and oxidation.

2. Clay is a major constituent of the waste. Thermal and biological treatments may change the charge on the surface of the clay particles or change the structure of the particles, allowing for more efficient recovery of lead during digestion/leaching.

3. The waste contains a high concentration of sulfates because the oil reprocessing procedure used sulfuric acid. Insoluble lead sulfates may have formed which are not readily recovered during sample preparation, digestion/leaching, and analysis.

A strategy was developed by Barr and Kiber Environmental Services to assess the potential for under-quantitation of total lead in untreated waste samples. A well homogenized waste sample was prepared by compositing four discrete samples that were collected from Source Area 2 for the immobilization and biological treatment studies. The approach was to compare the recovery of lead from this bulk sample using two typical EPA sample preparation procedures and two alternative sample preparation procedures. The typical EPA sample preparation procedures were: (A) EPA 3050, nitric acid and hydrogen peroxide digestion with dilute nitric acid reflux; and (B) EPA 3051, nitric acid microwave assisted digestion in a Teflon PFA vessel. The alternative sample preparation procedures were: (C) modified oven drying at 260°C followed by EPA 3050 digestion; and (D) solvent extraction and separation of organic and inorganic phases of the waste followed by EPA 3050 digestion of both phases.

Triplicate analyses were performed using inductively coupled plasma atomic spectroscopy (EPA 6010) for the products of all preparation and digestion methods. The Digestion Study Final Report prepared by Kiber Environmental is attached to this memorandum. Table 1 summarizes the results for the analyses.

The mean total lead concentrations resulting from the analysis of samples prepared using the four different methods were in the range of 13,000 to 26,000 mg/kg (1.3 percent to 2.6 percent). The reproducibility of results for each of the four methods was good. Method A is equivalent to the method that was used for the immobilization and biological treatment studies, and is the most common method used for the preparation and analysis of waste samples. The mean concentration for samples prepared using Method A (26,000 mg/kg) was higher than the mean concentration for untreated waste samples used in the immobilization and biological treatment studies (14,500 mg/kg). It was also higher than the mean concentrations for samples prepared using the other three methods. Neither of the two alternative preparation procedures (oven drying and solvent extraction) yielded total lead concentrations that were greater than those obtained using either standard EPA method.

It appears from the results that alternative sample preparation/ digestion procedures do not significantly increase the concentration of total lead recovered from Source Area 2 waste samples when lead concentrations are in the percent by weight range. The potential for the factors described above to interfere with the recovery of lead from samples with lower lead concentrations (less than 10,000 mg/Kg or 1 percent by weight) could not be determined during this study.

The composite samples prepared for this study and the immobilization and biotreatment treatability studies contained higher lead concentrations than samples analyzed in previous investigations. The mean concentrations for samples prepared using all standard EPA and alternative procedures were considerably greater than the mean concentrations reported for the Remedial Investigation and thermal treatability study completed for U.S. EPA. The results of this study demonstrate that previously reported results in the percent concentration range for lead are reproducible and should not be considered "outliers". Also, while this was favorable from the standpoint of having reasonable "worst case" samples for performing the treatability studies, it restricts our ability to assess lead concentration dependent analytical issues.

TABLE 1

TEST RESULTS (PREPARATION/DIGESTION STUDY)

TESTING CONDITION	EPA DIGESTION METHOD	TOTAL LEAD CONCENTRATION (mg/kg of Dry Weight)			
		REP. 1	REP. 2	REP. 3	MEAN
(A) Untreated Homogenized Waste - Reflux Digestion	3050	30000	22000	26000	**26000**
(B) Untreated Homogenized Waste - Microwave Digestion	3051	19000	12000	19000	**16600**
(C) Modified Oven Drying at 260°C - Reflux Digestion	None	19300 [a]	20800 [a]	18100 [a]	**19400**
(D) Solvent Extraction - Reflux Digestion	3580/3050				
Solid Phase		690 [b]	697 [b]	767 [b]	718
Evaporated Solvent Phase		13000	11000	13000	12300
Sum of Phases		13690	11697	13767	**13018**

[a] Corrected for volatile loss (61.36 percent) after oven drying.

[b] Corrected for moisture (30.3 percent).

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AR307372

BARR ENGINEERING CO.

MEMORANDUM

TO: Douglassville Record - Barr File No. 38/06-001 RAM 16

FROM: Eric Edwalds, Air Quality Specialist

SUBJECT: Incinerator Screening Impact Assessment

DATE: June 20, 1994

John Borovsky asked me to review the screening air dispersion modeling conducted for the Douglassville Superfund Site because of my experience with dispersion modeling and familiarity with the EPA's Air Pathway Analysis procedures. I have been involved with air modeling for the past 8 years starting with my Masters Degree thesis in atmospheric sciences and continuing with several projects requiring the use of standard EPA dispersion models for regulatory compliance demonstrations.

This memorandum discusses the screening air dispersion modeling that was conducted for the Douglassville Superfund Site. The dispersion modeling results are contained in Appendix A of the January 31, 1994 memorandum from Nancy Rios to Victor Janosik. Appendix A contains two reports (authors P. Flores and V. Edem) describing the modeling. The following discussion focuses on the estimated lead concentrations; specifics pertaining to the other compounds are not addressed.

1.0 INTRODUCTION

According to the Flores report (p.1), the Air/Superfund program was asked to perform a preliminary assessment of the maximum possible off-site ambient air concentrations from the proposed incinerator. The USEPA guidance document "Screening Procedures for Estimating the Air Impacts of Incineration at Superfund Sites" EPA-450/1-92-003 ('Incineration Guidance', EPA 1992a) was closely followed in their assessment.

It is important to note that the purpose of the modeling was to determine the maximum possible ambient air concentrations. This determination requires that conservative assumptions be made at all stages of the screening assessment. When non-conservative assumptions are made, they should be justified or otherwise documented. As will be pointed out in the following discussion, several non-conservative assumptions were made but not supported.

This discussion is presented in three parts: 1) assessment of the modeling conducted relative to the Incineration Guidance; 2) other EPA recommended modeling procedures; and 3) results obtained from attempting to replicate the results presented in Tables 2 - 5 of the Edem report.

2.0 MODELING ASSESSMENT

The purpose of conducting the preliminary assessment is to show that remedial alternative satisfies the two threshold criteria for remedy selection: 1) compliance with ARARs; and 2) the remedy selected is protective of human health and the environment (Incineration Guidance p.1). As will be shown, this preliminary assessment did not demonstrate compliance with ARARs. The question of whether the remedy selected is protective of human health and the environment is addressed in a separate memorandum (Debye, May 1994).

According to the Incineration Guidance (p.1), this assessment should have been conducted before the ROD was signed. An in-depth evaluation is necessary during the Remedial Design (RD) and testing phases; considering that this project is in the RD and testing phase, the value of conducting a preliminary assessment (as opposed to an in-depth assessment) at this time is questionable.

2.1 Modeling Procedure

In general, EPA's preliminary assessment followed the procedures recommended in the Incineration Guidance. Deviations from the Incineration Guidance are addressed below. EPA's assessment focused on demonstrating that incineration will not cause a violation of the NAAQS for lead.

The stack parameters used in the modeling are listed in item 5 of the Flores report. All of these parameters except stack height are equal to the default parameters listed in Table 3 of the Incineration Guidance. The default value of stack height is 8 meters whereas a stack height of 20 meters was used in the analysis. The Incineration Guidance (p.13) states that the default values in Table 3 should be used when actual parameters are not available. Stack height is a critical input parameter in the dispersion modeling analysis and justification for use of a 20-meter stack height should have been provided. Although 20-meter stack heights are not uncommon, the purpose of conducting the modeling was to determine the maximum possible ambient air concentrations, and in this case has resulted in EPA making a non-conservative assumption in completing the screening analysis.

The lead concentration in the waste and lead partitioning to the flue gas of 40% were obtained from the Final Design Analysis (100%) prepared by TAMS Consultants. The assessment acknowledged that the 40% partitioning to the flue gas was not a conservative assumption. The deficiencies and inaccuracies in the 40% partitioning value have been described in another memorandum (Hawkins, May 1994).

The screening model results section (Section 5.0 of the Edem report) was very brief and provided very little explanation of the procedures used to obtain the results. The use of the conversion factor of 0.08 to convert from hourly to annual average concentrations was inappropriately used as will be discussed in Section 2.3. A conversion factor of at least 0.10 should have been used. The assessment correctly stated that there is no conversion factor for converting from an hourly to a quarterly average concentration. Although the difference between quarterly and annual averages may be small, an attempt to adjust for this difference should have been made because the purpose of conducting the modeling was to determine the maximum possible ambient air concentrations, and in this case has resulted in EPA making a non-conservative assumption in completing the screening analysis.

Tables 2 - 5 of the assessment provide the results of the modeling. Four scenarios were considered: feed rates of 3 and 4 tons per hour with and without building downwash. Because building downwash was shown to be important, there is no basis for presenting results which do not consider downwash, except for comparative purposes. In Sections 7.2.5 and 8.2.5 of the Guideline on Air Quality Models (Revised) (EPA 1986; Appendix W of 40 CFR Part 51) it is specified that the building wake algorithms in the ISC2 model should be used when building downwash is an issue. EPA's use of the no building downwash concentration is non-conservative and inappropriate for completing the screening analysis.

In Section 1.2 of the Incineration Guidance, the overall approach of a screening assessment is presented. The last two steps of the approach, comparison of ambient air concentrations to ARARs and modeling summary (including a discussion of assumptions, recommendations, and conclusions), were not included in the modeling assessment. The omission of these two steps had significant ramifications in the interpretation of the results. First, the Rios memorandum assumed that the modeled concentration of 0.949 ug/m^3 (Table 4) was an achievable operating scenario that complied with the lead NAAQS. The inappropriateness of using 0.949 ug/m^3 to compare with ARARs is discussed below, however, if a modeling summary had been presented it is possible that the 0.949 ug/m^3 value would have been sufficiently qualified such that the Rios memorandum would have used a more appropriate ambient air lead concentration. Second, a discussion of assumptions is important because if a certain set of assumptions needs to be made in order to model compliance, these assumptions then become operation and design requirements. In this case, control efficiencies would have to be met, a 20-meter stack height would be required, and the building that was proposed for soils handling <u>could not be built</u>.

2.2 Comparison with ARARs

2.2.1 Appropriate ARARs

The assumed ARAR for the modeling assessment was the lead NAAQS of 1.5 ug/m^3. In Sections 4.2.1.2 (Table 4.2-4) and 6.4.2 of the TAMS report it was explicitly stated that one of the performance requirements for the incinerator was that metal emissions meet the Boiler and Industrial Furnace (BIF) regulations (40 CFR 266 Subpart H). In short, the Douglassville site needs to demonstrate compliance with the Tier III Reference Air Concentration (RAC) for lead listed in Appendix IV of the BIF regulation (40 CFR 266.106). The RAC for lead is 0.09

ug/m^3 (annual average concentration). It is not clear why this ARAR was not considered in the preliminary modeling assessment.

The EPA has proposed to change the lead NAAQS to 0.9 ug/m^3 for an annual average concentration (see Federal Register Vol.36, No. 35, pp.7171 - 7174). The change was proposed in 1991, therefore, this proposed change should have been considered in the comparison to ARARs.

2.2.2 Deficiencies in the Modeled Value

Several points regarding the modeling are presented below. These points are simply instances where the modeling conducted contradicted EPA modeling guidance. Considering that EPA conducted the modeling, it is significant that these discrepancies exist.

(i) In regulatory modeling situations, modeling results are either compared with increments or standards. The BIF regulations (RACs) are increments, i.e., the modeled concentrations cannot contribute more than the increment to ambient air concentrations. The lead NAAQS is a standard for total air quality. Therefore, it is the modeled concentration plus the background air concentration that is to be compared with the NAAQS (Section 8.2.1.1 EPA 1986; Appendix W of 40 CFR Part 51). The modeling assessment did not consider background ambient air lead concentrations in the comparison to the lead NAAQS.

(ii) The incinerator design includes a soils handling building which was included in the building downwash modeling scenarios. As stated above, by using the no-downwash scenario in the comparison to ARARs, a design change to the incinerator system would be required as part of the air quality compliance demonstration. Nowhere was this design change either justified, substantiated, or implied.

(iii) As discussed above, the use of the factor 0.08 to convert from a 1-hour concentration to an annual concentration is inappropriate for several reasons. The conversion factor for 1-hour to annual is given as 0.08 +/- 0.02 (EPA 1992b, p.4-16; EPA 1992c, p.D-1). The higher values of the conversion factor should be used when terrain and downwash effects are present (EPA 1992b, p.4-17; EPA 1992c, p.D-1), as is the case in this assessment. For clarification on the use of this scale factor, I contacted Gale Biggs (independent modeling consultant). Gale Biggs mentioned that most states require using the factor of 0.10 to convert from 1-hour to annual concentrations. The combination of terrain, downwash, and quarterly averaged concentrations would require this conversion factor to be even higher.

The conversion factors were plotted on a logarithmic scale to determine a reasonable estimate of a quarterly average conversion factor (see Figure 1). Using an annual conversion factor of 0.08, a quarterly conversion factor of 0.10 was obtained. I asked Gale Biggs if using the 0.10 quarterly conversion factor plus 0.02 for terrain and downwash considerations for a total conversion factor of 0.12 would be an appropriate application of the EPA methodology. He agreed and added that the 0.12 conversion factor would still not be conservative (i.e., a higher conversion factor would be warranted).

(iv) The selection of the SCREEN2-Valley model was not appropriate. Page 4-2 of the Guideline on Air Quality Models (Revised) (EPA 1986; Appendix W of 40 CFR Part 51) states: "When modeling for sources for which long term standards alone are applicable (e.g., lead), then the long term models should be used."

3.0 STANDARD MODELING PROCEDURES

Screening modeling assessments are the first step in determining if a proposed source may have an adverse impact on air quality. The screening procedures are based on generally conservative assumptions (e.g., meteorology). Therefore, if in a screening analysis a source is shown to be comfortably within air quality standards, then refined modeling may not be required. However, "If the concentration estimates from screening techniques indicate that the PSD increment or NAAQS may be approached or exceeded, then a more refined analysis is appropriate..." (Guideline on Air Quality Models (Revised), p.11-2). It is important to remember that screening models are not necessarily conservative and refined modeling does not necessarily result in lower predicted ambient air concentrations. However, confidence in model predicted concentrations increases with the level of model sophistication.

Inclusion of model output in a modeling assessment is standard reporting procedure (e.g., EPA 1989, p.2-76). Model output is used to verify input data, assess model performance, and point out areas that require further analysis. As discussed in Section 4.0 below, Barr could not reproduce the normalized concentrations presented in Section 5.0 of the Edem report using the given assumptions.

It was stated in both modeling reports that more refined modeling was not considered because the incinerator has not yet been designed. Even though final design parameters were not known, ranges of values for operating parameters could have been assumed (i.e., a sensitivity analysis could have been conducted). Refined modeling could be used to determine the different combinations of control devices, operating conditions, and stack parameters that will demonstrate compliance with ARARs. Because lead is a bioaccumulating compound with multiple human exposure pathways, additional control devices are generally preferred over changes in operating conditions or stack parameters to demonstrate compliance with the lead NAAQS (i.e., it is the total amount of lead emitted to the atmosphere that needs to be limited, not the rate of emission).

Given the ease of use of either the ISC2LT model or the ISC2ST model, a more refined modeling assessment could have been conducted at a relatively small expense. Although on-site meteorological data have not been collected, there are several meteorological data sets from nearby National Weather Service reporting stations that could have been obtained from the OAQPS Bulletin Board. These data sets would have provided reasonable input to a refined model. The Guideline on Air Quality Models (Revised) (EPA 1986) contains a complete discussion of levels of refined modeling.

4.0 VERIFICATION OF SCREENING MODELING

An attempt was made to reproduce the screening modeling results using the information presented in the Edem report. Due to uncertainties in the site configuration, receptor distances, and receptor elevations, duplication of the maximum hourly normalized concentrations was not achieved. However, ranges for receptor distances and elevations were used to bracket possible concentrations. The site location map (Figure 2-1, TAMS Report) was used to determine possible source/receptor configurations.

Table 1 compares the model results given in the Edem report to those obtained during the verification attempt. The controlling case (i.e., those with the highest concentrations) occurred using simple terrain, qualitatively verifying the results in the Edem report. However, only the case using building downwash could be bracketed by the ranges of source/receptor configurations. The lowest normalized concentration that we obtained in the no building downwash scenario was 8 percent higher than the value reported in the Edem report.

The fact that we could not duplicate the results used to determine compliance with the lead NAAQS was surprising. Modeling results should be easily verifiable based on reported input data. More importantly, lack of verification of modeling results suggests that the reported results are in error. Including model output files in the modeling report would have answered any questions regarding the discrepancies between the two modeling efforts.

Table 2 contains comparisons of EPA's modeled ambient air lead concentrations to those obtained using conservative assumptions, as is appropriate for a screening assessment. Three sets of concentrations are presented: 1) those in Tables 4 and 5 of the Edem report; 2) those obtained using EPA's model results and reasonably conservative assumptions as discussed above; and 3) those obtained from a separate modeling run using an 8 meter stack height. The highest predicted ambient air concentration in Table 2 of 197 ug/m^3 uses conservative values appropriate for a screening level assessment including: building downwash, input values from the Incineration Guidance, and upper 95% confidence intervals for mean concentrations (EPA 1992d). The 197 ug/m^3 concentration is more than 200 times higher than the concentration (0.949 ug/m^3) used by EPA to represent compliance with the lead NAAQS. Table 2 clearly shows that the value of 0.949 ug/m^3 used by the EPA to demonstrate compliance with the lead NAAQS is based on non-conservative assumptions and does not fulfill the stated purpose of determining the "maximum possible off-site ambient air concentrations of emissions from the proposed incinerator" (Flores report, p.1).

SECTION 5.0 SUMMARY

The screening modeling conducted for the Douglassville site was conducted to demonstrate that the remedial alternative satisfies the two threshold criteria for remedy selection: 1) compliance with ARARs; and 2) the remedy selected is protective of human health and the environment. This demonstration was not successful. Although there were some deficiencies in the modeling procedures (e.g., use of scaling factors), these were secondary considerations in the overall effectiveness of the screening assessment. The two major problems with the modeling were: 1) the selection of the appropriate ARARs, and 2) the lack of more refined modeling.

The appropriate standard to compare the modeling results to is the BIF Tier III standard for lead (0.09 ug/m^3 annual average concentration). However, if for some reason not stated the lead NAAQS is the appropriate ARAR, more refined modeling is still necessary to demonstrate compliance. Particularly troubling in this preliminary assessment was the fact that modeled compliance ignored building downwash, although the final design includes this building.

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REFERENCES

USEPA 1986 Guideline on Air Quality Models (Revised). EPA-450/2-78-027R (Appendix W of 40 CFR Part 51). OAQPS. Research Triangle Park, NC. July 1986.

USEPA 1989. Air/Superfund National Technical Guidance Study Series Volume IV - Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis. EPA-450/1-89-004. OAQPS. Research Triangle Park, NC. July 1989.

USEPA 1992a. Air/Superfund National Technical Guidance Study Series Screening Procedures for Estimating the Air Impacts of Incineration at Superfund Sites. EPA-450/1-92-003. OAQPS. Research Triangle Park, NC. February 1992.

USEPA 1992b. Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised. EPA-454/R-92-019. OAQPS. Research Triangle Park, NC. October 1992.

USEPA 1992c. Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised). EPA-454/R-92-024. OAQPS. Research Triangle Park, NC. December 1992.

USEPA 1992d. Supplemental Guidance to RAGS: Calculating the Concentration Term. PB92-963373. OSWER. Washington, D.C. May 1992.

TABLE 1
MODEL VERIFICATION RESULTS

Modeling Assessment	Normalized Concentration ($ug/m^3/g/s$) Building Downwash	No Building Downwash	Receptor Distance (meters) Building Downwash	No Building Downwash
Edem Report	334.7	144.2	Not Reported	
Barr Minimum	282.9	155.8	976	1070
Barr Maximum	454.8	202.0	674	604

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TABLE 2
MODEL RESULTS USING APPROPRIATELY CONSERVATIVE ASSUMPTIONS

Modeling Assessment (see footnotes for explanation)	Bldg Dwash (Y/N)	Modeled Normalized Conc. ($ug/m^3/g/s$)	Source Mat'l Lead Conc. (ppm)	Flue Gas Partition (%)	Quarterly Conversion Factor	APCD Control Efficiency (%)	Ambient Air Lead Concentration (ug/m^3)
EPA original	N	144.2	4072	40	0.08	95	0.949
EPA original	Y	334.7	4072	40	0.08	95	2.20
Conservative Assessment 1	N	144.2	8091	100	0.12	40	84.7
Conservative Assessment 1	Y	334.7	8091	100	0.12	40	197
Conservative Assessment 2	N	144.2	8091	64	0.12	95	4.52
Conservative Assessment 2	Y	334.7	8091	64	0.12	95	10.5
Conservative Assessment 3	N	264.3	8091	100	0.12	95	12.9
Conservative Assessment 3	Y	954.1	8091	100	0.12	95	46.7
Conservative Assessment 4	N	264.3	8091	64	0.12	95	8.28
Conservative Assessment 4	Y	954.1	8091	64	0.12	95	29.9

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TABLE 2 (Continued)

A feed rate of 4 tons per hour was used for all model runs.

The EPA original modeling assessment data were obtained from Tables 4 and 5 of the Edem report.

Conservative Assessment 1 uses: the normalized concentrations obtained by EPA; a lead concentration in the source material of 8091 ppm which represents the upper 95% confidence level for the mean (Hawkins, May 94); a flue gas partition of 100% (Table 5 of the Incineration Guidance); a quarterly conversion factor of 0.12 (Section 2.2.2 of this memorandum); and an APCD control efficiency of 40% (which represents a Venturi Scrubber with 60 inch pressure drop as specified in Item 2 of the Flores report; refer to Table 6 of the Incineration Guidance).

Conservative Assessment 2 uses the same assumptions as Conservative Assessment 1 except: a flue gas partition of 64% (which represents the lower 95% confidence level of lead remaining for source area 'B' at an incineration temperature of 1200°F (Hawkins, May 94, p.6; computed as 100 - 36.30)); and an APCD control efficiency of 95% (Table 5 of the Edem report).

Conservative Assessments 3 and 4 used normalized concentrations based on an 8 meter stack height (from Table 3 of the Incineration Guidance) and a receptor located at a distance of 500 meters with a terrain elevation 8 meters above stack base. The difference between Conservative Assessments 3 and 4 is in the flue gas partition.

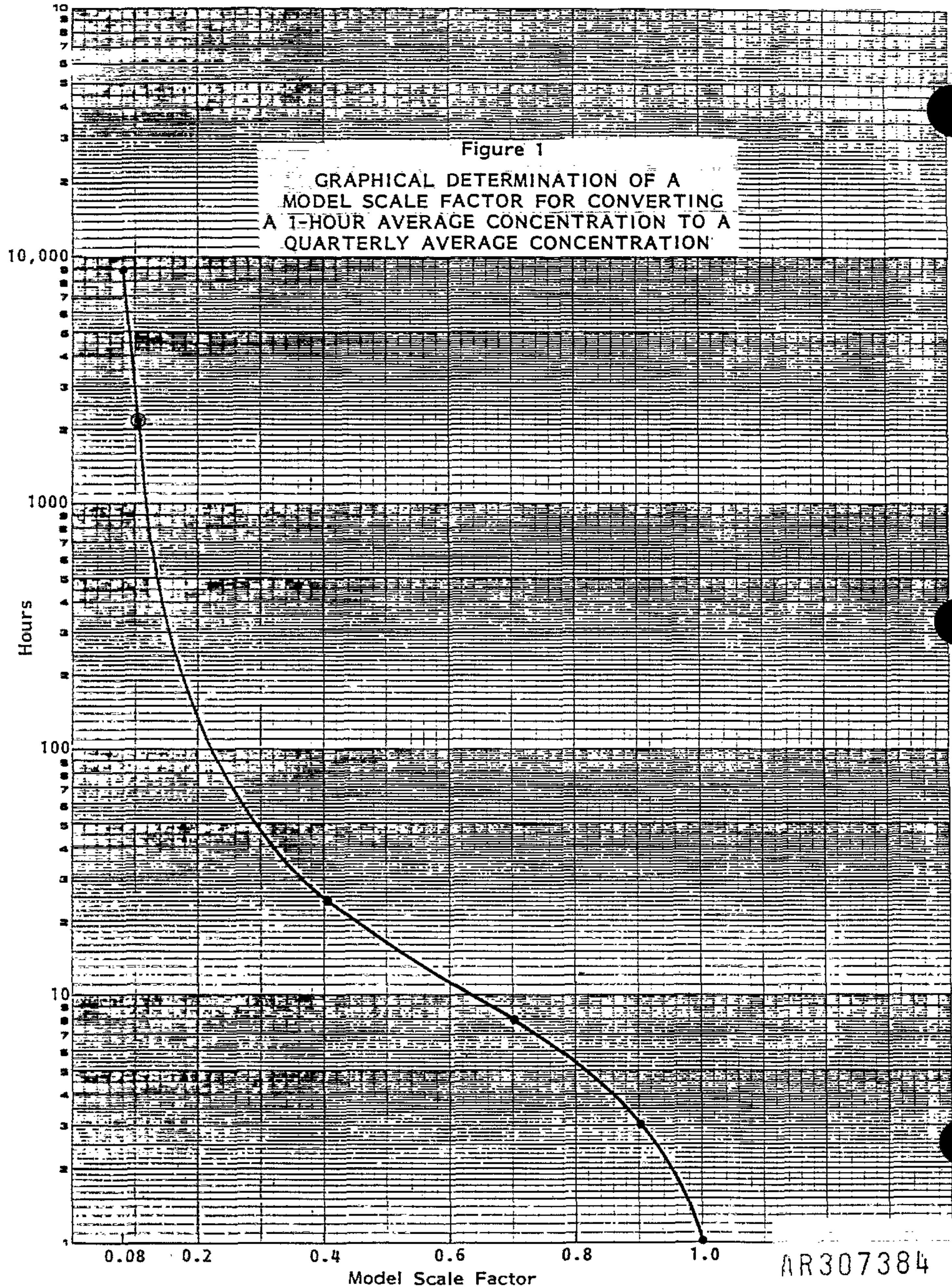

Figure 1
GRAPHICAL DETERMINATION OF A MODEL SCALE FACTOR FOR CONVERTING A 1-HOUR AVERAGE CONCENTRATION TO A QUARTERLY AVERAGE CONCENTRATION
10,000
1000
100
10
Hours
0.08
0.2
0.4
0.6
0.8
1.0
Model Scale Factor

AR307384

BARR ENGINEERING CO.

MEMORANDUM

TO: John P. Borovsky, Principal-in-Charge

FROM: Harry L. Debye, Ph.D., Toxicologist

SUBJECT: Lead and Human Health Issues Related to the Proposed Incineration of Waste Materials at the Douglassville Site

DATE: June 20, 1994

CREDENTIALS

I have more than 25 years of experience in the areas of toxicology, epidemiology, human health and ecological risk assessments; environmental impact studies; contaminant release and atmospheric dispersion modeling techniques.

I have directed retrospective epidemiological studies and served as study director for numerous experimental toxicology research projects and cytogenetic studies. As Director of Health, Safety, Toxicology and Environmental Affairs for a large multinational chemical company, I was responsible for all toxicology research, health and environmental risk assessments, and epidemiology.

PURPOSE

A review of the Douglassville Disposal Superfund Site, Direct Exposure Pathway Risk Assessment for the Proposed On-Site Incinerator conducted by U.S. EPA Region III indicated several major deficiencies in the assessment of exposure and risk associated with lead emissions. The State of Pennsylvania has established a community childhood lead prevention program in designated areas throughout the state. Berks County has been selected to be part of the program and is designated to be a childhood lead prevention area. Reading, the county seat of Berks County, and all other communities within the county are therefore also childhood lead prevention areas. A review of blood lead data provided by the Pennsylvania Environmental Health Department (PEHD) was conducted to ascertain the status of childhood lead poisoning in Berks County and the potential implications for the selection of an incineration remedy at the

Douglassville Site. After review of lead in blood and lead toxicity data, pertinent regulatory and guidance documents the following comments are presented for your consideration:

SUMMARY

1. Community Childhood Lead Prevention

The purpose of the Community Childhood Lead Prevention Program is to identify and respond to sources of lead not cases of lead poisoning. Elevated lead in blood levels were measured in children in Berks County. The blood lead data provided by the PEHD for Berks County does not allow for drawing definitive conclusions regarding the extent and magnitude of lead exposure in children in Douglassville or Berks County, nor does it provide definitive information regarding predominant lead sources. However, in view of the lead in blood screening results which show that a significant number of children in Berks County are affected by lead poisoning, all actual or potential lead sources should be rigorously evaluated. To be able to make informed decisions, the community must be provided with all pertinent information regarding actual or potential lead sources, including a complete and thorough assessment of the emissions of lead from combustion sources. Failure to do so seriously impacts the effectiveness of the childhood lead prevention program.

In evaluating the potential health risk impacts of the proposed hazardous waste incinerator for the Douglassville site remedial action project, EPA should have presented all relevant data, including direct (inhalation of airborne lead) and indirect exposures (soil ingestion, crop ingestion, milk ingestion, fish ingestion, surface water ingestion and ingestion of mother's milk). EPA's failure to fully evaluate risks (including accumulative risk) associated with lead emissions from the proposed on-site incinerator in an area which has documented instances of lead poisoning is in direct conflict with EPA's and NCP's guidance for the selection of alternatives which must be based on effectiveness. Part of the evaluation of effectiveness involves an assessment of risk to the community (EPA 1991, RAGS/HHEM Part C, Risk Evaluation of Remedial Alternatives).

2. Compliance with CERCLA and NCP

The NCP establishes nine criteria in Section 300.430(e)(9)(iii) to use in evaluating alternatives in detail and in selecting a remedy. Parts of three of these criteria, overall protection of human health and the environment, long-term effectiveness and permanence, and short-term effectiveness, directly relate to risks. CERCLA requires an evaluation of risk during the screening of alternatives process to identify (and eliminate from consideration) alternatives which clearly represent unacceptable risks (EPA, 1991). RAGS/HHEM Part C (Risk Evaluation of Remedial Alternatives) states that the guiding principle is that the risk evaluation should be tailored to provide the RPM with specific information that is needed to support the selection or design of a remedy (e.g., the relative risks associated with alternatives, the alternatives that best meet the remediation goals). A detailed quantitative risk analysis is required when the types, levels and/or availability of hazardous substances are expected to change significantly as a result of remediation (e.g., incineration) and toxicity (e.g., lead, arsenic, dioxins/furans, PAH's) as well as proximity of populations is of concern (especially when special sensitive subgroups, such as children are potentially affected). RAGS/HHEM Part C further identifies some potentially significant releases associated with incineration. This includes, in addition to stack emissions, fugitive emissions, discharge of scrubber liquor and blowdown, disposal of ash and other solid residues. RAGS/HHEM further emphasizes the importance of risk communication during the remedial alternatives screening process in order to gain acceptance by the public. As stated under Item 1, additional exposure pathways and exposure routes should have been evaluated to present a more complete assessment of potential human health risk associated with the proposed incinerator (in view of the elevated lead in blood levels) to provide a better understanding of the contribution to the lead levels present in various environmental media.

HEALTH EFFECTS

Exposure to lead can result in toxic effects in the brain and central nervous system, the peripheral nervous system, the kidneys, and the hematopoietic system. There is equivocal evidence that exposure to lead causes genotoxicity in humans and animals. The available evidence indicates that lead presents a hazard to reproduction and exerts a toxic effect on conception, pregnancy, and the fetus in humans and experimental animals (EPA, 1977; EPA, 1980).

Children have potentially higher exposure levels to lead than adults, because their hand-mouth contact may introduce nonfood items into their gastrointestinal tract (Lin-Fu, 1973). The gastrointestinal absorption efficiency in this group has been estimated at around 40 percent (Ziegler et al., 19768). Very severe lead exposure in children (blood lead levels equal or greater than 80 μg/dL) can cause coma, convulsions, and even death (CDC, 1991). Chronic exposure to inorganic lead by ingestion or inhalation can cause lead encephalopathy, and severe cases can result in permanent brain damage. Permanent learning disabilities and impaired neurobehavioral development in children that are clinically undetectable (associated with blood lead levels as low as 10 μg/dL) may be caused by exposure to relatively low levels of lead. (Davis and Svendsgaard, 1987; Mushak et al., 1986). Other effects such as growth impairment and decreased hearing acuity may occur at low levels (Schwartz et al., 1986, 1987; Bornschein et al., 1986; Schulka et al., 1987). Maternal and cord blood lead levels of 10 to 15 μg/dL appear to be associated with reduced gestational age and reduced weight at birth (ATSDR, 1988).

Epidemiologic studies have identified harmful effects of lead in children at blood lead levels at least as low as 10 μg/dL. Some studies have suggested harmful effects at even lower levels, but the body of information accumulated so far is not adequate for effects below about 10 µg/dL to be evaluated definitively. As yet, no threshold has been identified below which harmful effects of lead do not occur (CDC, 1991). The ATSDR estimated that in 1984, 17 percent of all preschool children had blood lead levels in excess of 15 µg/dL (ATSDR, 1988).

LEAD SOURCES AND PATHWAYS

Children can be exposed to lead from many different sources (paint, solder), through different pathways (i.e., air food, water, soil dust). Lead entering the body from different sources and through different pathways present a combined toxicological threat (ASTDR, 1988). Multiple, low level inputs of lead can result in significant aggregate exposure. Identification of a single, predominant source or pathway for children with lower (i.e., 10 to 20 µg/dL) blood lead levels, is not always possible (CDC, 1991).

The Centers for Disease Control in it's publication "Preventing Lead Poisoning in Young Children" (CDC, 1991), presents an overview of sources and pathways of lead exposure in children:

Lead Based Paint - Lead based paint remains the most common high dose source of lead exposure for preschool children. Nationwide, about 3 million tons of lead remain in an estimated 57 million occupied private housing units built before 1980. Children are exposed to lead when they ingest chips of lead based paint or ingest paint contaminated dust and soil.

Soil and Dust - Soil and dust act as pathways to children for lead deposited from paint, gasoline and industrial sources. Movement of lead and its inorganic and organolead compounds as particulates in the atmosphere is a major environmental transport process. Because lead is immobilized by the organic component of the soil, lead deposited from the air is generally retained in the upper 2 to 5 centimeters of undisturbed soil (EPA, 1986). Soil lead levels within 25 meters of roadways are typically 30 to 2,000 parts per million (ppm) higher than natural levels, with some roadside soils having concentrations as high as 10,000 ppm. Soils adjacent to houses painted with exterior lead paints may have lead levels above 10,000 ppm. Measured lead levels in soil adjacent to smelters range as high as 60,000 ppm (EPA, 1986).

As part of normal play and hand to mouth activities, young children may inhale or ingest lead from soil and/or dust. The soil and dust ingestion exposure pathway appears to be more significant than inhalation for young children (EPA, 1986).

Drinking Water - Contamination of drinking water usually occurs in the distribution system. Lead in drinking water is probably absorbed more completely than lead in food. Young children may absorb greater than 50 percent of the lead they drink (ATSDR, 1988). In general, lead in drinking water is not the predominant source for poisoned children. In some circumstances, however lead exposure from water may be unusually high (In some areas of the United Sates - e.g., Pennsylvania - cistern are used to store water. If lead solder was used, the acidic environment may promote the leaching of lead).

Airborne Lead - Although lead used in gasoline has been markedly reduced, previous use has resulted in widespread contamination of soil and dust. Except around point sources (e.g., used oil refineries, incinerators), airborne lead is only a minor exposure pathway.

Food - Lead in food can come from several sources: soil in which plants are grown; air and rain; food processing; contact with lead solder or ceramic containers used to store food; and contact with lead dust in the home. Under some circumstances, food grown in gardens may have an elevated lead content if the garden soil is high in lead or if there are high lead concentrations in the air or water used for irrigation.

HUMAN EXPOSURE

Quantifying human exposure to lead requires an understanding of ambient lead levels in environmental media such as air, soil, surface water, and groundwater, their interrelationships as well as the relationship between environmental lead and blood lead levels.

The Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) is designed to facilitate: (a) rapid delineation of the relationship between environmental lead and blood lead in children; and (b) calculation of the risk of elevated blood lead (i.e., the probability of a given child or group of children having blood lead concentrations exceeding a specified level of concern. EPA, 1994).

Children may be exposed to varying levels of lead in differing environmental media or may be exposed to the same levels in the same environmental media, however the lead in blood levels still may vary because of behavioral differences (i.e., play activity, mouthing activity, etc.), exposure differences (difference in contact with environmental media, location, duration etc.), measurement variability, biological diversity (differences in the biokinetic distribution and elimination) and differences in food consumption (i.e., nutritional status, time of ingestion etc.) (EPA, 1994).

The inter-individual variability is characterized by the Geometric Standard Deviation (GSD). Even if all values for the environmental exposure variables were known, it would at best only be possible to predict the typical blood lead level expected for a child of a certain age. Risk is the probability of exceeding the blood lead levels of concern. The IEUBK model calculates risk based on the following assumptions:

1) Observed blood lead = (Predicted blood lead) * (Random deviation)

2) The random deviation is lognormally distributed with geometric mean or median = 1, and a geometric standard deviation (GSD) defined by: GSD = exp((standard deviation of ln(blood lead))

3) The GSD is the same for all values of the predicted blood lead

The IEUBK model provides default values for lead in the various environmental media (air, soil, water etc.) as well as a default GSD value. This GSD value is based on calculations of GSDs from specific sites. The blood lead GSD can be calculated from blood lead data.

BACKGROUND LEAD LEVELS

To evaluate the fit of the environmental default values with site (area) specific values and the GSD default value with the variability in a site-specific blood lead study, the Pennsylvania Environmental Health Department was contacted to: (1) determine if a childhood lead prevention program is in effect; (2) obtain results of lead in blood screening results; (3) obtain ambient lead in air concentrations; (4) obtain lead in soil and drinking water data.

Site or area specific lead in drinking water or soil were not available. Lead in agricultural soil data for the northeastern counties of Pennsylvania are presented in a paper by G. Holmgren (Holmgren et al., 1992).

Lead in air data providing trends from 1983 to 1992 as well as quarterly mean and maximum values are presented in the Pennsylvania Air Quality Report for

1992. For 1992, the annual arithmetic mean for the DER Region 3 Non-Air Basin as measured at monitoring stations at Lyons East and West (approximately 18 miles from the Site) was 0.11 and 0.16 μg/M and a maximum quarter value of 0.17 and 0.21 μg/M, respectively.

The PEHD administers a very limited childhood lead prevention program for Berks County. The program includes a reporting requirement for (program and nonprogram participants) for those cases where confirmed (three consecutive measurements) lead in blood levels exceed 15 μg/dL. The areas in which the childhood lead prevention program is implemented (including Berks County) are simply areas where children on medical assistance programs can be screened free of charge at physician's or parents's discretion (Carol McDonald communication). According to the PEHD, blood lead results for children tested through private providers tend to be higher than those for children in the assistance program, possibly indicating specific (clinical symptoms, suspected high environmental lead levels) physician concerns as opposed to the assistance program where more random tests may be conducted. The childhood lead prevention program has not yet been fully developed. Douglassville lead screening results are not available. The 1993 Unduplicated Lab Reports provided by the PEHD list the following results for Berks County:

Berks County:

15 - 19 μg/dL	18 cases
20 - 24 μg/dL	119 cases
25 - 49 μg/dL	111 cases
50 - 69 μg/dL	11 cases
> 70 μg/dL	6 cases

Total cases greater than 15 μg/dL: 265

The report states that: "These statistics do not necessarily represent total number of cases in Pennsylvania."

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Children with venous blood lead levels in the range of 15 to 19 μg/dL are at risk for decreases in IQ of up to several IQ points and other subtle effects (CDC, 1991). The Centers for Disease Control recommends that children with lead in blood levels ranging from 15 to 19 μg/dL should receive nutritional and educational interventions and more frequent screening. In addition, when these lead in blood levels persist, environmental investigations and intervention should be done (CDC, 1991).

INTERVENTION PROGRAM

The CDC presents the following guidance for interpretation of results and actions to be taken as a result of specific lead in blood concentrations (CDC, 1991):

Because lead poisoning is completely preventable the CDC recommends implementation of a community level lead intervention program. This program includes among others:

1) Screening and surveillance: Defining populations at risk and the location of the highest exposure potential through blood lead screening and environmental surveys. The environmental sources and pathways of lead exposure should include among others lead in soil, lead from industrial sources (lead in air and subsequent deposition) and wastes (including waste treatment).

2) Risk Assessment and integrated prevention planning: Analysis of all available data to assess the sources of lead, exposure patterns, identify high risk populations and develop primary prevention plans. Public health officials must be provided with all of the information developed (blood lead levels, environmental survey data, and demographic information) to create the most accurate picture of community lead hazards, including sources of lead, exposure patterns

and high-risk populations in order to develop an integrated primary prevention plan.

3) Outreach and education: Information dissemination to all interested parties regarding lead exposure prevention programs. Outreach and education must take place during every phase of the community activity, beginning before health screening and environmental surveys and ending when risk abatement is complete. Local, state and federal agencies dealing with health, environmental, housing and children issues should be closely interacting in providing pertinent information (EPA, 1994).

4) Hazard reduction: The goal of hazard abatement is the systematic elimination of lead hazards in the community. Before the hazard abatement step the community must decide, based on all available data gathered during the risk assessment, which lead hazards to target.

Given the significant numbers of children affected by lead poisoning (even at the limited scope of the Berks County lead prevention program) it would seem that the general public and health officials would have great interest in completely understanding the potential significance of lead emissions related to the operation of an incinerator at the Douglassville Site. EPA's misrepresentation of the lead levels in the materials to be incinerated and the omission of significant exposure pathways and exposure routes seriously hampers a complete assessment of the additional relative risk posed by incinerator lead emissions.

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BARR ENGINEERING CO.

MEMORANDUM

TO: John P. Borovsky, Principal-in-Charge

FROM: Harry L. Debye, Ph.D., Toxicologist

SUBJECT: Douglassville Disposal Superfund Site Risk Assessments

DATE: June 21, 1994

INTRODUCTION

The EPA risk assessment misrepresents the level of potential hazard to public health and the environment because the risk assessment is represented as being conservative, and yet numerous assumptions tend to be nonconservative (unprotective). In addition, pathways, exposure routes, and potential chemicals of concern and impact on the environment were omitted from the risk assessment thereby magnifying the questionable value of the assessment. The EPA risk assessment for the proposed on-site incinerator is seriously flawed for some of the following specific reasons:

1) The risk assessment did not consider the indirect exposure pathways to ensure that the incinerator can be operated in a manner protective of human health and the environment (EPA, 1994). The risk assessment only addresses a single exposure pathway (air pathway) and exposure route (inhalation). The air/inhalation pathway is not the most significant pathway for some of the chemical compounds identified (i.e., arsenic, lead) or compounds which may be emitted (dioxins/furans, PAHs).

2) Carcinogenic and chronic noncarcinogenic data were used to estimate risk. However, endpoints such as developmental, genotoxic, and immunosuppressive effects, which may occur at lower levels than carcinogenic effects, were not evaluated in the risk assessment.

3) No serious effort was made to identify products of incomplete combustion (PICs). The lack of quantification of potential risk to on-site workers and exposed population posed by the PIC's is a serious omission.

4) The risk assessment did not address the potential impact of the facility on the environment.

5) The risk assessment did not address upset conditions, fugitive emissions, and accidents which could substantially affect short-term risk.

6) As stated in my Memorandum of June 20, 1991 (HLD Memo June 20, 1994, Lead and Human Health Issues Related to the Proposed Incineration of Waste Materials at the Douglassville Site), the State of Pennsylvania childhood lead prevention program shows that a significant number of children in Berks County are affected by lead poisoning. Cumulative risks due to lead emissions (i.e., stack and fugitive) associated with the proposed on-site incinerator and from existing sources (i.e., ambient lead in air, soil, house paint etc.) were not addressed.

SPECIFIC COMMENTS

<u>Page 1 - Third Paragraph</u>

"While the Agency considers the indirect exposure pathway to be an equally important risk assessment, current methods for assessing this exposure pathway are not fully developed yet. Therefore, only the direct exposure pathway has been evaluated in this Report."

Comment:

As stated in the Report, the indirect exposure pathway is of concern, especially for compounds that are persistent in the environment and have the potential for retention within the receptor and can bioaccumulate or biomagnify through trophic levels in food chains. In addition to the inhalation exposure route, exposure through soil ingestion, crop ingestion, milk ingestion, fish ingestion, surface water ingestion and ingestion of mother's milk must be included in the estimation of quantitative risk to human health to provide a complete assessment. Exposure to arsenic, cadmium, dioxin/furan through deposition and subsequent food chain transfer can constitute a substantial portion of the overall intake. Indirect exposure can contribute significantly to the overall body burden and associated health risks.

The EPA document Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (EPA RAGS/HHEM, 1991) Part C states that: "Remedial alternatives, in addition to being evaluated for the degree to which they protect human health, are evaluated for their potential to protect ecological receptors." Impact on the environment through deposition of persistent and bioacummulative chemical compounds should be addressed quantitatively (when possible) or qualitatively (EPA, 1993).

Dispersion models (i.e., ISC; ISC-COMPDEP), fugacity-based compartment transfer models and other mathematical models which can be applied to evaluate intercompartment behavior, diffusion and deposition processes are presently available. It is recognized that the models have certain limitations, they do, however, provide methodologies for estimating deposition. The limitations inherent in the models can be addressed in the uncertainty analysis. Therefore, to be consistent with EPA guidance (EPA RAGS/HEMM Part C 1991 and Waste Minimization and Combustion Strategy Memorandum, 1994 and it's Implication for Superfund), the indirect exposure pathway should have been included in the risk assessment, just as it has been performed (or recommended) for other sites (e.g., Bridgeport Rental and Oil Services Site, WTI incinerator). EPA's apparent attempt to avoid such an analysis due to the unavailability of "fully developed" methods is not defendable.

Page 2 - First Paragraph

"The purpose for the risk evaluations during the remedial design is to ensure that the selected remedy will be protective."

Comment:

The Report does not address potential risks associated with upset conditions, start-up/shutdown conditions, spills, accidents, or fugitive emissions (i.e., process, excavation, hauling), which could substantially contribute to the overall risk.

The Report does not address the potential impact on the environment. An ecological risk assessment should be an integral part of the risk assessment (RAGS/HHEM Part C) in view of the close proximity of the site to State Parks and waterways. Important ecological habitats (i.e., wetlands, grasslands, forested areas, etc.) near the proposed incinerator should be identified. Flora and fauna within the potential area of impact should have been reviewed. The presence of threatened or endangered species should have been identified. Compounds expected to be emitted that are persistent and have the potential for bioaccumulation through trophic levels in food chains should have been evaluated for potential ecological effects in order to ensure that the selected remedy will be protective.

Page 2 - Fourth Paragraph

"In the risk assessment that follows, short-term risks can occur over a shorter period (2-3 years)."

Comment:

As stated above, upset conditions could result in relatively high emissions of waste stream components and products of incomplete combustion (PIC). The report does not address the potential for short-term and/or long-term health risks associated with upset conditions. Emissions resulting from these events could result in higher annual emissions than those presented in the risk assessment report

Page 3 - Third Paragraph

"Although it is recognized that significant levels of new chemicals should be considered in evaluating short-term and long-term risk for the proposed on-site incinerator, the available data do not allow for this detailed assessment."

Comment:

A more detailed profile of the waste stream could be developed. Based on the incinerator characteristics, operating parameters and information developed for similar waste streams/incineration systems a more detailed list of expected PIC's could be developed and provide an estimate of the relative emission rates and removal efficiencies. Upset conditions should also have been included in this estimation. The assumption that all PICs are present as benzene provides some level of conservatism, and there is some merit in the assumption that concentrations of dioxins and PAH compounds would be expected to be low at the proposed high temperatures. However, downstream formation through catalytic action could nevertheless occur and should therefore be evaluated in the risk assessment. Failure to include this consideration does not conform to EPA's statement that the risk assessment is intended to be conservative.

Page 4 - Fourth Paragraph

"A refined evaluation of the MEI was not feasible in this assessment due to the lack of site specific information needed to run a more refined model such as the ISCLT model."

Comment:

. This statement is misleading and unwarranted. Substantial site specific data are available to refine the risk assessment. For example, the RI/FS, as well as the ROD, provide information on general demography and land use. As stated in this document an adult care facility is located across Highway 724 from the site. The Douglassville Site is located along a segment of the Schuylkill River that is classified as "recreational" under the Pennsylvania and Scenic Rivers Act and is considered as a component of the Pennsylvania Scenic River System. The recreational classification includes the river as well as adjacent land that can be viewed from the river. Additionally the report states that the Schuylkill River and its tributaries are used extensively for municipal and industrial water supply, and recreation. In the reach extending downstream from the Douglassville Site to the confluence of with the Delaware River, about 47 miles long, 7 public water supply systems withdraw water directly from the Schuylkill River. The nearest public water supply intake (Pottstown Borough Authority) is located approximately 4 river miles downstream of the site. French Creek State Park is located within 5 miles south of the site.

. A childhood lead prevention program is in effect in Berks county. Data regarding lead in blood in excess of 15 $\mu g/dL$ for children in Berks county and Reading are available, which may be useful in defining a specially sensitive subgroup for the exposure assessment.

Demographic data available from the 1990 census can be used to broadly identify high risk areas (pre-1960 housing; density of preschool children in the area).

A site visit should provide additional information regarding population demographics, sensitive population subgroups (i.e., day care centers, recreational facilities, etc.), land use (i.e., home gardens, agricultural use etc.), sensitive environmental areas, topography and special terrain features important for the selection of the appropriate dispersion model and receptors.

Page 5 - Second Paragraph

"It should be noted here that it is usually preferred that maximum soil concentrations be used in the screening analysis. However, average soil concentrations were used as initial soil concentrations fed into the incinerator, not the maximum soil concentrations, due to the presence of hot spots in the on-site soils."

Comment:

The values used as initial soil concentrations fed into the incinerator (Table 1 in the Risk Assessment) represent the arithmetic mean of soil boring data obtained for the treatability study (additionally, in calculating the arithmetic mean, one of the higher values was eliminated because it was considered an outlier). However, because of the uncertainty associated with estimating the true average concentrations at the site (limited number of samples and variability in measured values), EPA guidance requires that the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable (EPA 1992. Supplemental Guidance to RAGS: Calculating the Concentration Terms). In addition, both average and maximum concentration are necessary to determine contaminant feed rates to be used in long-term and short-term health effects assessments (EPA 1991, RAGS/HHEM Part C).

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The procedures used by EPA, in the Douglassville risk assessment, to derive a representative contaminant concentration of waste material is contrary to EPA guidances (EPA-RAGS/HHEM Parts A and C; EPA-A/SNTGSS) and is seriously flawed resulting in a substantial underestimation of emissions and associated calculated risk.

Page 6 - Second Paragraph

"A direct risk assessment for the inhalation route was calculated for both a child and an adult resident living at the site and breathing ambient air at the maximum annual concentrations calculated by the Screen 2 model."

Comment:

Other sensitive receptors, such as elderly people (adult care facility located near the site - RI/FS and ROD), individuals engaged in active sports with higher breathing rates (recreational areas such as the Schuylkill River and adjacent land were identified in the RI/FS and ROD) should have been included as MEIs. Additionally, because of the proximity of the site to the Schuylkill River and municipal water intakes, and agricultural areas indirect exposure pathways and routes (i.e., soil ingestion; plant and animal uptake of contaminants deposited on soil; fish uptake of contaminants deposited on water; food consumption, water ingestion, etc.) should have been evaluated in the risk assessment to provide a more comprehensive estimate of risk to human health and the environment.

Data from the Pennsylvania childhood lead prevention program for Berks County show elevated lead in blood levels in a significant number of children (HLD Memo June 20, 1994). Specially sensitive children (i.e., children with measured elevated lead in blood levels - greater than 10 μg/dL) as well as children in the age range of 18 to 24 months, because lead in blood peaking occurs at this age (CDC, 1991) should have been selected as subgroups in the exposure evaluation related to lead emissions.

Page 7 - First Paragraph

"It should be noted that subchronic toxicity criteria were not available for use in the assessment of noncarcinogenic risk."

Comment:

Evidence indicates that exposure to lead presents a hazard to reproduction and exerts a toxic effect on conception, pregnancy and the fetus. Exposure to PCBs has been associated with developmental effects. Dioxin is associated with immunosuppressive, reproductive and developmental effects. The risk assessment should have addressed these potential effects (EPA RAGS/HHEM, 1989).

Acute effects associated with the chemicals of concern (i.e., acid gases) due to system upsets should have been be evaluated in the risk assessment.

As mentioned in a previous comment, since young children are deemed a high risk group for lead exposure because of their higher dietary intake in mg/kg of body weight than that of adults and tend to ingest greater quantities of dirt than adults, the ingestion route should have been included in the risk assessment.

As stated previously, sensitive subgroups (elderly people, active individuals with corresponding higher breathing rates) should have been included in the risk assessment (EPA RAGS/HHEM, 1989).

Page 9 - Second Paragraph

"Significant hazards due to exposure to barium in ambient air are not likely, however, under less conservative exposure scenarios."

Comment:

The uncertainty associated with the calculated risks for all COC's should have been addressed in a quantitative uncertainty analysis section. An evaluation of the "worst case", "central tendency" and "high end" exposure distribution, including sensitive subgroups, would provide a more appropriate basis for an evaluation of the uncertainties associated with the input parameters to the dispersion and risk calculation models. A sensitivity analysis would be helpful in identifying those assumptions having the greatest impact on the variance of the output.

Page 10 - First Paragraph

"This model was not used in this assessment due to the lack of sufficient data (e.g., soil data) to properly run the model."

Comment:

The Centers for Disease Control (CDC, 1991) defines lead poisoning as a blood lead level of 10 microgram per deciliter (μg/dL) or greater. The agency for Toxic Substances and Disease Registry estimates that approximately 17 percent of all children in the United States aged 6 months to 5 years have blood lead levels of 15 μg/dL or greater. There is currently no lead level believed to be safe for children.

As stated previously, a childhood lead prevention program is in effect for Berks County and is administered by the Pennsylvania Environmental Health

Division. Lead in blood levels in excess of 15 microgram per deciliter of blood are reported for a significant number of children in Berks County (HLD Memo June 20, 1994).

The use of the Uptake/Biokinetic Model for Lead (using regional or local published data for lead in paint, soil, crops, air and water; or estimated through the use of appropriate deposition models and partitioning factors; or using default values provided with the model, adjusted based on best judgement) would provide an estimation of total lead body burden from all potential sources, through inhalation and ingestion. This would result in a more appropriate estimation of overall risk than through evaluation of inhalation exposure of airborne lead resulting from incinerator operation as is accomplished by comparison to the NAAQS.

<u>Page 10 - Second Paragraph</u>

Since it is assumed that only 40 percent of the lead will partition to the APCD, the actual lead air emissions may be higher if more lead is partitioned to the APCD and is subsequently emitted from this source.

Comment:

A more detailed evaluation of the gas-solid partitioning under various conditions (i.e., temperature, residence time, presence of acid gases, etc.) should be conducted. The variability in partitioning, and operating parameters (i.e., feed rate, control efficiencies)) for the proposed on-site incinerator as well as topographic features which affect the dispersion characteristics and have an impact on emissions should have been addressed in the sensitivity analysis (D. Hawkins, 1994). EPA's failure to consider the variability of the partitioning in the Thermal Treatability Testing Report results in a high level of uncertainty regarding nature and speciation of PICs.

Page 11 - First Paragraph

"Dioxins were not cited as COC,s at this site and are not expected to be a major concern."

Comment:

As stated in previous comments (and consistent with EPA RAG/HHEM guidance) a more detailed rationale must be provided for exclusion of dioxins and PAH's.

Page 11 - Third Paragraph

"This is a conservative estimate, since it is not expected that all of the PIC's will be present as benzene."

Comment:

The next sentence in the Report (page 11, third paragraph), states that PICs may include other hazardous constituents such as dioxins and PAHs. To be consistent with the stated conservatism these compounds should have been included in the risk assessment, or a more detailed rationale provided for their exclusion (EPA RAG/HHEM 1989). (See also previous comments).

Page 12 - Sixth Paragraph

"Acid gases are primarily of an environmental concern and have far more consequences in the destruction of ozone and in the development of acid precipitation than it does on human health."

Comment:

While the above statement is generally true, nevertheless in view of the acute effects, the potential impact during upset condition should have been evaluated.

Page 13 through 16

Conclusions/Uncertainty Analysis

Comment:

A more thorough, complete and rigorous risk assessment could have been *achieved if the following issues had been fully addressed:*

Barium risk level - Dispersion model selection should be reviewed. Model input parameters (dispersion model, incinerator operating conditions and exposure model inputs) should be subjected to a sensitivity analysis to better define those parameters contributing to the uncertainty.

Lead exposure - Use of the Uptake/biokinetic lead model should provide a more conservative estimation of risk.

Indirect exposure - Risks associated with indirect exposure (i.e., ingestion of soils contaminated with emission deposits, ingestion of vegetables grown near the site, ingestion of milk produced near the site, ingestion of fish from nearby surface waters, ingestion of mothers milk, ingestion of and contact with surface water during swimming in nearby rivers, contact with sediments during wading in nearby rivers in soil, food consumption, water ingestion) should have been evaluated through use of available dispersion and fugacity based models.

PICs - An effort should have been made to better define PICs. Potential PICs (i.e., dioxins, PAHs) should be evaluated in the risk assessment, or more detailed justification provided for their exclusion (EPA RAG/HHEM, 1989).

PM10 Emissions - The Air/Superfund National Technical Guidance Study Series provides a methodology for estimating PM10 emissions. (EPA, 1990) PM10 Emissions should have been included in the risk assessment.

PCBs - Uncertainty associated with the use of oral toxicity criteria in lieu of inhalation toxicity criteria should have been quantified.

Exposed populations - Sensitive subgroups such as elderly individuals, active people, infants, should have been included in the risk assessment. Additionally, impacts on ecological receptors should have been evaluated (EPA RAG/HEMM, 1989).

Toxic endpoints - An assessment of developmental, genotoxic and immunosuppressive effects should have been included in the risk assessment.

Soils data - The 95 UCL of the arithmetic mean as well as the maximum concentration should have been used to provide high end, and worst case in addition to central tendencies.

Lead emissions - Gas/solid partitioning under proposed operating conditions should have been better defined in order to narrow the uncertainty associated with lead portioning into the APCD. Other lead emission sources should have been identified to provide an estimation of the overall impact of the proposed incinerator on ambient lead levels.

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BARR ENGINEERING CO.

MEMORANDUM

TO: Douglassville Record - Barr File No. 38/06-001

FROM: Beth Havlik, P.E., Chemical Engineer

SUBJECT: Update on Incineration as a Remedy for Superfund Sites

DATE: June 22, 1994

I am a chemical engineer specializing in air quality issues with over six years of industrial experience and three years of consulting experience. I have coordinated Barr's efforts with respect to air quality and incineration issues from the time that Barr became involved with the Douglassville Site.

In the continuing effort of realistically estimating the cost of incineration at the Douglassville site prior to implementation, we have been following current research on the incineration of hazardous wastes. Additionally, we have been following decisions from other EPA Regional offices that have allowed for remediation through other technologies even though incineration was the originally prescribed remedy.

Research on incineration technology has continued since Barr completed an analysis of alternatives for remediation of Operable Unit 2 of the Douglassville Disposal Site in Berks County, Pennsylvania (Barr, August 1993). We believe the new information supports the position of Barr Engineering and the Douglassville PRP group that incineration is not a good alternative for the Douglassville source material. The new information supports our four main conclusions regarding incineration of that material.

1. Four Superfund sites have recently adopted alternate remedies to on-site incineration

We had previously documented that at least two incineration projects were canceled due to public opposition to the remedy. One was a proposal by Clean Harbors Inc. to build a new hazardous waste incinerator in Braintree, Massachusetts. Clean Harbors withdrew their proposal after a bitter fight with the Massachusetts Department of Public Health over concerns of increased rates of respiratory disease and other health effects (Boston Globe, September 22, 1990). The other was the Sand Springs Superfund Site located in Tulsa City, Oklahoma. The Record of Decision (ROD) for the Sand Spring site was amended from its original remedy of on-site incineration to allow for implementing solidification/stabilization as long as certain performance criteria were met. New information shows that for at least four additional Superfund sites alternate remedies to on-site incineration have been selected, including three sites with RODs requiring on site incineration.

Arrowhead The 1986 ROD for the Arrowhead Site required incineration of sludge and filter cake (byproducts of an oil rerefining process) as well as contaminated soils and sediment. In February of 1994, the ROD was changed to remediate sludge and filter cake by chemical dissociation and to remediate contaminated soils and sediment by placement in a permitted RCRA Subtitle D facility.

Motco On July 22, 1993, a consent decree was entered for the Motco Site in Galveston County, Texas (BNA Law Toxics Daily, November 18, 1993). In this consent decree, EPA opted not to incinerate the Motco wastes on-site. Instead, contaminated liquids, sludges, and tars will be shipped off-site for incineration, and contaminated soils will be consolidated and capped permanently at the site (Abrahamson, 1994). EPA Region VI spokesman Roger Meacham told BNA April 9 that the change in cleanup procedures will allow the site to be cleaned up faster and that the new cleanup method will be more cost-effective (BNA State Environment Daily, April 22, 1993).

Commercial Oil Services The Commercial Oil Services Site, located in Oregon, Ohio, is a former waste oil, waste sludge, and solvent re-refining site. On-site stabilization and on-site incineration alternatives were evaluated during the engineering evaluation/cost analysis for treatment of surface impoundment sludges. Stabilization was selected as the remedy in November 1992. According to an Action Memorandum for the Site (U.S. EPA, November 1992), incineration was considered to be not timely, not cost effective, and subject to overwhelming community relations concerns. Concerns were expressed regarding material handling systems which often break down and increase cost, significant institutional constraints, and the necessity of a test burn. In addition, according to the Action Memorandum, "The on-site incineration technology provides no greater environmental protection level than does the selected option of on-site stabilization/solidification, on-site disposal and capping."

Delaware Sand & Gravel The April 1988 ROD for the Delaware Sand & Gravel Site required incineration of buried drums and contaminated soil in drum disposal and tank storage areas. Subsequent to issuance of the ROD, a pre-design investigation revealed that the Site had not been adequately characterized during the Remedial Investigation. As a consequence, U.S EPA determined that the previously selected remedy was not appropriate, On July 29, 1993, the U.S EPA published a proposed plan to amend the ROD to allow a soil vapor extraction and bioremediation remedy (U.S. EPA, April 29, 1993).

2. EPA cannot assure that lead emissions into the air would be adequately controlled as further evidenced by new incineration research on the fate of lead.

Several pilot-scale incineration tests were conducted on lead-contaminated hazardous wastes and synthesized wastes at the USEPA Incineration Research Facility located in Jefferson, Arkansas during 1991 and 1992 (USEPA 1993). The results of these tests demonstrated great variability in the fate and capture of lead. The amount of lead that partitioned to the flue gases ranged from 1 to 82%. The overall system efficiency, considering the lead captured by bottom ash, flyash, and scrubber liquors ranged from 20 to 99 percent. Lead capture efficiency of the wet scrubber was as low as 3%, and not more than 84%. Higher lead emissions correlated with higher lead concentration and the presence of the element chlorine (in the same or lower concentrations than the Douglassville material); the formation of highly volatile lead chlorides is seen as the most plausible explanation (USEPA 1993, p. 57). These results confirm that scientific and engineering methods cannot be used to predict air emissions of lead from incineration of contaminated sludges without pilot scale testing.

3. EPA cannot assure that lead emissions into the air would be adequately controlled as further evidenced by new incineration research on upset conditions.

EPA inspections at hazardous waste incinerators nationwide uncovered that half suffer from frequent process upsets that result in waste feed cutoff (WFCO) episodes. Concern over "increases in hazardous constituent trace metals, hazardous constituent organics, and HCl emissions" (USEPA 1993 p. 87) with repeated WFCO episodes motivated research on the fate of metals during such episodes.

The results of that research, however, could not be conclusive for lead emissions, because of significant disagreement between the two identical tests baseline (not WFCO) conditions. The variability in the lead emissions associated with those two essentially identical test conditions prevented any emission increases due to WFCO's from being significant when compared to the "noise" of variability. Though frustrating from the standpoint of answering the motivating concern, a significant, relevant conclusion can be drawn: current technology (including process control, analytical methods) is not sophisticated enough to produce repeatable results, continuous operation, or predictable lead emissions from incineration of hazardous wastes, especially those contaminated with metals.

4. Most, if not all, of the byproduct streams would be classified as hazardous wastes.

The incineration research that used Superfund site wastes, with lead concentrations much lower than those at the Douglassville site, found that one or more of the byproduct streams would be TC hazardous for lead. Conclusions from these tests include: "scrubber liquor discharge from a wet scrubber APCS could become a TC hazardous waste in the incineration of 'hot-spot' lead-containing soils, or under scrubber operation at minimum blowdown." (p. 17); "the collected particulate from a dry APCS, such as a fabric filter, would be a TC hazardous waste." (p. 17); and "The unfiltered scrubber liquor ... had lead concentrations above TCLP limits." (p.58).

The generation of additional hazardous waste streams presents both a technical problem and a policy issue concern. The technical problems of disposal of hazardous waste are well known, however, the issue of cross-media contamination is perhaps more significant. Transfer of contamination from one medium to another can be considered acceptable if there are reductions in the mobility, toxicity, and volume of the hazardous substances. The current research suggests that the mobility of lead will be increased by incineration because of air emissions. The toxicity of lead will not be decreased by incineration, and could be increased if the airborne lead compounds are more toxic than their current form. Finally, if all of the byproduct streams are hazardous (as is indicated by this and previous studies) and the ash needs to be stabilized, then the purported benefit of volume reduction will need to be reevaluated.

This new information provides continuing evidence of the problems associated with incineration of metal-containing wastes and incineration in general. Because of its volatility and the many different toxic compounds that it can form, lead poses a particularly difficult control problem for incineration systems. Public opposition to on-site incineration continues to increase, and the public is more sophisticated at delaying and sometimes preventing incineration from being implemented. These issues will certainly factor into the ultimate success and cost of remediating the Douglassville site. The high cost of incineration is not justified because incineration does not provide a corresponding environmental benefit over lower cost remediation technology alternatives for the Douglassville site. Our opinion is that incineration is inappropriate because remediation alternatives at other Superfund sites have switched from on-site incineration, lead emissions from incineration cannot be assured to be adequately controlled, and most byproduct streams resulting from incineration would be hazardous wastes.

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REBUTTAL to EPA DECISION DOCUMENT
Incinerability, Partitioning, and Technical Issues

Author: Douglas S. Crate, P.E.

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INTRODUCTION

Mr. Douglas S. Crate is a registered Professional Engineer in the State of Texas with 17 years of experience in process (chemical) engineering in the Chemical, Petrochemical, and Hazardous Waste Industries. For the last ten years Mr. Crate has specialized in combustion engineering in the production/operations, design, and consulting areas. Mr. Crate's wide range of projects in the Hazardous Waste Industry include operations, incinerator/scrubber system design, incinerator process simulation and modeling, CERCLA litigation support, RCRA Permitting, and generation and/or execution of seven RCRA Trial Burn Plans. Mr. Crate's expertise in hazardous waste incineration is uniquely based on a thorough and well-proven understanding of technical and design fundamentals, significant hands-on experience, and current familiarity with regulatory procedures and methods.

This report is an objective assessment of the significant technical issues surrounding incineration of wastes at the Douglassville Disposal Site in Berks County, Pennsylvania. The issues are limited to those contained in the EPA Region III Response (and its supporting documentation) which was submitted to the United States District Court for the Eastern District of Pennsylvania on April 25, 1994 by the EPA Environmental Enforcement Section. The issues addressed in this report include the following:

(a) Scale of the Cross-Tessitore treatability test;
(b) Treatability and incinerability of Douglassville waste;
(c) Appropriateness of incineration as a remedy for Douglassville;
(d) Impact of chlorine on emission of lead;
(e) PIC emissions;
(f) Draft guidance for implementation of exposure assessment for RCRA;
(g) Appropriateness of partitioning and wet scrubber efficiency assumptions

These technical issues will be discussed in the context of their presentation in the various memoranda comprising EPA Region III's Response Documents.

DISCUSSION

Oberacker Memorandum

The Oberacker memorandum, generated by Mr. D. A. Oberacker and Ms. M. K. Richards of the EPA's Risk Reduction Laboratory in Cincinnati, Ohio provides the primary technical review of the facts and data leading to the decision for incineration as the remediation method of choice at Douglassville. The recommendations presented in the memorandum are summarized as follows:

- The waste is relatively uniform in composition and "fairly well characterized";

- pilot scale treatability studies are desirable to "fine tune the desirable design and operating parameters for incineration and to demonstrate the partitioning of lead";

- lead concentrations present the only apparent challenge to incineration;

- a large, transportable incinerator should be able to treat the waste in a 1- to 2-year period.

TRC Assessment

Statements made in the memorandum regarding the incinerability of Area 2 waste at Douglassville reflect the general experience and opinion of the author. The approach taken in the memorandum avoids any direct, in-depth critical review or examination of the Cross-Tessitore data, which apparently is the foundation for the EPA's decisions concerning treatability and incinerability. The memorandum provides no hard data to substantiate the viewpoint of the author and concludes (in part) with a restatement of the EPA's decision for incineration. The Oberacker memorandum fails to meet our expectation of an extensive and careful review of the technical issues which underlie the EPA's decision for the remediation of the Douglassville Disposal Site.

Given the available data, we do not concur with the conclusions of the Oberacker memorandum. After careful review of the TAMS report we find that portions of the Cross-Tessitore data (specifically, that data relating to the partitioning of lead) are *not acceptable* for conclusions regarding the technical viability of incineration at Douglassville. Further, the Cross-Tessitore data are not *sufficient* for discussions of incineration's commercial viability (cost effectiveness) at Douglassville. The Cross-Tessitore investigation ranks as a process feasibility study, and should not be relied upon for conclusions other than whether or not further testing is advisable. There are several reasons for this:

1. *Scale of Investigation.* The scale of the Cross-Tessitore incinerability tests is too small to be representative of a full size installation. Scale-up factors are required to assess the behavior of mass and heat transport phenomena with increased equipment size[5]. Scale-up factors can only be estimated *after* larger scale pilot testing has been completed and a comparison of transport effects made. Transport phenomena have a direct and significant effect on thermal decomposition of material at the interior of the kiln waste charge[7,6]. Heat transfer rates (rather than the kinetics of the combustion reaction ocurring at the exterior of the waste charge) provide the controlling step in thermal decomposition and therefore must be known in order to determine the optimum length, diameter and rotational speed of the kiln.

   The effect of scale is realized when considering the emission restrictions placed upon permitted (or permittable) incineration systems. For instance, determination of destruction and removal efficiency (DRE) to the fourth decimal place, as specified by 40 CFR 264.343, is all but impossible for bench scale investigations. Inherent sampling and analytical errors and the small volume of flue gas evolving from the combustion of several grams of waste converge to render such determinations meaningless. Therefore bench scale work alone can not provide sufficient data to enable prediction of full scale performance unless enough full (or pilot) and bench scale data exist and are available to develop general correlations between the two. The Cross-Tessitore work does not provide this information.

2. *Representative Samples.* The waste charged to the bench scale reactor is not representative of the composition of the waste *in-situ* or to the waste as as it would be charged to a full size kiln. The TAMS report does not indicate that a statistically acceptable, three dimensional sampling grid was used to collect samples from Area 2, nor does it indicate that the samples used to charge the bench reactor were composited in a statistically meaningful manner. According to the Report, two to three samples were collected at two soil boring locations in three arbitrarily delineated sections of the two-acre site comprising Area 2. The Report further states that the borings taken from each section were composited and designated Matrix A, B, or C according to the section of Area 2 from which they were taken. These composited samples were used to charge the bench scale thermal reactor used by Cross-Tessitore. This procedure is at variance with the guidance offered in the EPA's Test Methods for Evaluating Solid Waste[9]. In order to obtain *representative samples*, this guidance provides for the collection and analysis of *preliminary samples* from which estimates of the final number of random (not haphazard) samples to be taken. The guidance clearly defines the proper procedure and several methodologies for insuring results which are statistically representative of contamination within the site. The TAMS report does not mention any of the statistical determinations that are required by the EPA guidance or that a sampling plan incorporating an acceptable random sampling method was used. Other similar EPA guidance is also indicated in a text prepared by D. S. Barth of the University of Nevada-Las Vegas for the EPA Environmental Research Center.[1]

Any conclusion that (a) the waste as tested by Cross-Tessitore is of statistically representative composition, or (b) the waste *in situ* is sufficiently uniform for design or cost estimating purposes is certainly premature and likely inaccurate.

The Oberacker memorandum concedes that waste charge composition is vitally important by pointing out that commercial incineration facilities "...do a lot of waste blending with other waste streams to adjust the waste's properties and of course for business reasons". In spite of this statement, however, the memorandum fails to critically assess the sampling and compositing methods indicated in the TAMS report.

3. *Insufficient Data.* The Cross-Tessitore investigation does not include an analysis of the flue gas. Cross-Tessitore justifies this omission by indicating that a mathematical mass balance is sufficient for determining the speciation of

the flue gas. This assumption seriously lacks merit because of its total disregard for predictable sampling and analysis errors. Without the corroborating data of the flue gas analysis, no basis for confidence in the *accuracy of a mass balance* exists, except in the cases where more lead was found in the ash than was charged to the bench reactor. In this case we confidently assign zero confidence to the analytical accuracy and resultant "mass balance".

Even though a combined data base of ash and flue gas analyses would lack acceptable precision and accuracy for design purposes, the additional data is justifiable to establish the need for or direction of further work. We may say with certainty that the data required to support the EPA's implied predictions of APCS loading or even to suggest the type of APCS best suited to the Area 2 waste are not available in the Cross-Tessitore investigation.

The tone of the Oberacker memorandum generally indicates support for incineration as the treatment of choice for Douglassville waste material. However this support is not directly extended to the data being considered. The memorandum carefully hedges its supportive comments with a recommendation for pilot scale studies. The memorandum suggests pilot testing "...to fine tune the desirable design and operating parameters for incineration and to demonstrate the partioning of lead...". In addition, the summary statement "...a well designed and operated transportable incineration system should be capable of safely and effectively treating the waste *for organics*" falls short of support for incineration of soils with high lead concentrations, such as those found at Douglassville. Again we point out that conclusions and support for incineration as given in the Oberacker memorandum result from opinion and speculation rather than the data which are required to achieve a "well designed unit". Such data are not available.

Impact of Chlorine on Lead Emissions. The memorandum states that "lead levels of this magnitude in the waste should not behave in a volatile manner so as to present a stack emissions problem...". However, Table III-9 of the EPA's *Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators* (August 1989) suggests that 0.0% of the lead in the waste feed is partitioned to the ash even when no chlorine is present in the waste feed charge. Further, studies conducted at the USEPA Risk Reduction Laboratory[2,4,8,11,12,13] indicate that lead partitioning is especially sensitive to small amounts of chlorine present in the feed. One of the studies concludes that lead is relatively volatile in the presence of chlorine, with 83.7% of lead partitioning to ash when no feedstock chlorine is present, but dropping rapidly to 15.0% when feedstock chlorine reaches 4% by weight.

The view expressed in the Oberacker memorandum is not consistent with the EPA's published guidance nor with available contemporaneous research. Again the memorandum provides only opinion, speculation, and/or conjecture.

Appropriateness of Incineration. Any discussion of the "appropriateness" of a remediation method must include the terms of its *cost and effectiveness* in comparison with those of other available methods. As mentioned previously, neither the Cross-Tessitore data nor the Oberacker memorandum provide adequate evidence for the effectiveness of incineration at Douglassville. The Oberacker memorandum does raise several issues that bear upon the cost of incineration, but does not discuss them. In stating that "...commercial facilities typically do a lot of waste blending with other waste streams to adjust the waste's properties and of course for *business reasons*", the memorandum seems to suggest that the waste composition data indicate an atypical uniformity of the Area 2 waste, and by extension, an atypically optimistic impact on through-put costs. Similarly, the memorandum raises the issues of water injection (in addition to waste blending techniques) and ash solidification, both of which carry heavy cost implications. The Oberacker memorandum thereby acknowledges the impact of cost-oriented issues, but fails to provide critical or meaningful discussion of them. The tone of the memorandum indicates a reluctance to state clearly that a determination of these criteria is impractical if not impossible at the bench scale level and not within the scope of feasibility assessments such as the Cross-Tessitore work.

Considered alone, on-site waste blending is an expensive operation. It is relevant and important here to note that waste feed blending costs have been the source of disputes with on-site incineration vendors stemming from charges of mis-representation of the waste characterization[3]. These disputes have resulted in litigation, work stoppages and other schedule disruptions. Considering these facts it is obvious that costs associated with waste blending and the potential costs of inaccurate waste characterization (ie, composition and uniformity) should neither be neglected nor made on the basis of feasibility data.

The memorandum makes no attempt to compare available treatment options. The memorandum concedes that a 2- to 3-man week review by the EPA's "own expert consultant firms" would be required to fully assess the report submitted by the Barr Engineering Company and entitled "Supplemental Alternative Analysis Report - Operable Unit 2 - Phase II".

Flores Memorandum

The Flores memorandum was prepared by Ms. Patricia Flores. Ms. Flores is the Air/Superfund Coordinator for the Program Development & Assessment Section of EPA Region III. Her memorandum provides the relevant points of law and technical background regarding the formation of dioxin during incineration. The memorandum summarizes by saying that dioxin and other products of incomplete combustion are generated primarily as a function of the operational control parameters of the incinerator and to a lesser extent as a function of the chlorine content of the waste incinerator.

TRC Assessment

PIC Emissions. Ms. Flores' statement that "Emissions of PIC cannot be determined by predictive methods, they must be monitored during a trial burn" makes a strong point regarding risk assessment of incineration systems. Ms. Flores' remark highlights the conservative posture of the EPA regarding incineration risks. The conservative posture taken by Ms. Flores seems inconsistent with Region III's advocacy of incineration as the treatment of choice on the basis of several bench-scale determinations, all of which were so excessively small as to preclude measurement of emissions in the ppm range.

Ms. Flores indicates that possible causes of PIC emissions include low temperatures due to quenching, residence time short-cicuits, and waste/combustion air mixing effects. These criteria are the focus of effective design studies. She further states that operational control parameters are of greater concern than chlorine content of the waste regarding the emission of PICs. An obvious conclusion from Ms. Flores' remarks is that the bench scale tests performed during the Cross-Tessitore investigation can not be considered adequate for the determination of highly important design criteria, especially those which relate to the emission of PICs.

Draft Guidance. The Implementation of Exposure Assessment Guidance for RCRA is issued as a draft document which is not to be cited or quoted. However the document clearly conveys the conservative posture of the EPA with regard to emission of PICs such as chlorinated dibenzo-p-dioxins and dibenzofurans. Given the requirement (as correctly restated by Ms. Flores) of 99.9999 percent DRE for all dioxin and PCB wastes, the EPA's concern for the amount of potentially emitted dioxin or dibenzofuran is quite high. These toxic compounds are apparently of great concern to the EPA even when they are emitted at rates less than 1/50,000 of the hydrocarbon mass being emitted in the stack of a permitted (or otherwise permittable) incinerator operating at the lawful minimum DRE. Again this seems inconsistent with EPA Region III's advocacy of incineration as the treatment of choice for Douglassville on the basis of the Cross-Tessitore bench scale incinerability test.

Kunz Memorandum

The Kunz memorandum was prepared by Ms. Patricia Flores for Mr. Joseph W. Kunz, Chief of the Program Development & Assessment Section of EPA Region III. The memorandum contains a revised exposure assessment of the predicted emissions from the proposed incinerator at Douglassville Area 2 Superfund Site. The memorandum indicates that the data presented in the exposure assessment will subsequently be used to prepare a risk assessment for the site. Regarding the destruction of organics in the waste, the memorandum makes (and clearly states) the assumption that the proposed incinerator will operate with a DRE of 99.9999%. Regarding the partitioning of lead in the incineration system, the memorandum restates the EPA's conservative guidance for lead partitioning (100% partitioning to the flue)[10] but assumes for purposes of the exposure assessment that 40% of the lead partitions to the flue.

TRC Assessment

Partitioning Assumptions. The Kunz memorandum indicates that the EPA is apparently willing to abandon without question its own guidance regarding partitioning for lead on the basis of feasibility grade studies such as the bench scale incinerability investigation performed by Cross-Tessitore. As in the Oberacker memorandum, the EPA here again fails to examine the critical issue of the validity of the Cross-Tessitore data. Also as before the EPA provides no rationale nor corroborating data from other studies to support its use of a lead partitioning factor so dramatically at variance with its own published guidance material. Certainly the use of the Cross-Tessitore data leads to a reduced calculated emission rate and a consequentially reduced risk associated with lead. The wide disparity which exists between the lead partitioning factor suggested by the guidance and the partitioning of lead in the Cross-Tessitore studies diminishes confidence in either number and is evidence that more study is necessary before incineration can be recommended as the treatment of choice for the Douglassville Site.

Scrubbing Efficiency Assumptions. Scrubbing efficiencies of 99% for hydrochloric acid (HCl) and hydrofluoric acid (HF) are common in practice and the literature. Likewise the scrubbing efficiency for SO_2 as stated in the Kunz memorandum is supportable in practice.

SUMMARY

The EPA's Decision Document falls short of substantiating its claim regarding incineration as the treatment of choice for the Douglassville Disposal Site. None of the memoranda addressed in this report directly challenge the validity of the data contained in the TAMS Report nor cite other relevant data from literature or commercial sources. Further, none of the memoranda examine the cost-effectiveness of incineration as opposed to other available technologies. Supporting comments concerning incinerability of the waste are largely opinion and add very little substance to the EPA's original position, which in fact was based on small scale feasibility studies undertaken by Cross-Tessitore.

Assumptions made in several of the memoranda are inconsistent with previously published EPA guidance or research. Most notable are the Kunz memorandum's unsupported acceptance of the available lead partitioning data and the Oberacker memorandum's assumptions on the affect of chlorine on lead partitioning. The type of examination provided by these two authorities can only support the original conclusion made by the EPA and can hardly be described as adding any value to the question of incinerability of waste at Douglassville.

Even while providing what amounts to "moral support" for incineration at Douglassville, the Oberacker memorandum calls for further study on a larger scale to answer the questions pertaining to design and operation of the proposed incineration system and to further "demonstrate the partitioning of lead". Similarly, the strong position taken by the Flores memorandum regarding determination of risk assessment by actual test as opposed to determination by predictive methods adds weight to the argument that a decision of incineration as the treatment of choice is premature.

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United States Environmental Protection Agency

Office of Solid Waste and Emergency Response Washington, D.C. 20460

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EPA

Supplemental Guidance to RAGS: Calculating the Concentration Term

Office of Emergency and Remedial Response
Hazardous Site Evaluation Division, OS-230

Intermittent Bulletin
Volume 1 Number 1

The overarching mandate of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is to protect human health and the environment from current and potential threats posed by uncontrolled releases of hazardous substances. To help meet this mandate, the U.S. Environmental Protection Agency's (EPA's) Office of Emergency and Remedial Response has developed a human health risk assessment process as part of its remedial response program. This process is described in *Risk Assessment Guidance for Superfund: Volume I — Human Health Evaluation Manual* (RAGS/HHEM). Part A of RAGS/HHEM addresses the baseline risk assessment, and describes a general approach for estimating exposure to individuals from hazardous substance releases at Superfund sites.

This bulletin explains the concentration term in the exposure/intake equation to remedial project managers (RPMs), risk assessors, statisticians, and other personnel. This bulletin presents the general intake equation as presented in RAGS/HHEM Part A, discusses basic concepts concerning the concentration term, describes generally how to calculate the concentration term, presents examples to illustrate several important points, and, lastly, identifies where to get additional help.

THE CONCENTRATION TERM

How is the concentration term used?

RAGS/HHEM Part A presents the Superfund risk assessment process in four "steps": (1) data collection and evaluation; (2) exposure assessment; (3) toxicity assessment; and (4) risk characterization. The concentration term is calculated for use in the exposure assessment step. Highlight 1 presents the general equation Superfund uses for calculating exposure, and illustrates that the concentration term (C) is one of several parameters needed to estimate contaminant intake for an individual.

For Superfund assessments, the concentration term (C) in the intake equation is an estimate of the arithmetic average concentration for a contaminant based on a set of site sampling results. Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable. The 95 percent UCL provides reasonable confidence that the true site average will not be underestimated.

Why use an average value for the concentration term?

An estimate of average concentration is used because:

Supplemental Guidance to RAGS is a bulletin series on risk assessment of Superfund sites. These bulletins serve as supplements to *Risk Assessment Guidance for Superfund: Volume I — Human Health Evaluation Manual.* The information presented is intended as guidance to EPA and other government employees. It does not constitute rulemaking by the Agency, and may not be relied on to create a substantive or procedural right enforceable by any other person. The Government may take action that is at variance with these bulletins.

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Highlight 1
GENERAL EQUATION FOR ESTIMATING EXPOSURE TO A SITE CONTAMINANT

$$I = C \times \frac{CR \times EFD}{BW} \times \frac{1}{AT}$$

where:

I = intake (i.e., the quantitative measure of exposure in RAGS/HHEM)
C = contaminant concentration
CR = contact (intake) rate
EFD = exposure frequency and duration
BW = body weight
AT = averaging time

(1) carcinogenic and chronic noncarcinogenic toxicity criteria[1] are based on lifetime average exposures; and

(2) average concentration is most representative of the concentration that would be contacted at a site over time.

For example, if you assume that an exposed individual moves randomly across an exposure area, then the spatially averaged soil concentration can be used to estimate the true average concentration contacted over time. In this example, the average concentration contacted over time would equal the spatially averaged concentration over the exposure area. While an individual may not actually exhibit a truly random pattern of movement across an exposure area, the assumption of equal time spent in different parts of the area is a simple but reasonable approach.

When should an average concentration be used?

The two types of exposure estimates now being required for Superfund risk assessments, a reasonable maximum exposure (RME) and an average, should both use an average concentration. To be protective, the overall estimate of intake (see Highlight 1) used as a basis for action at Superfund sites should be an estimate in the high end of the intake/dose distribution. One high-end option is the RME used in the Superfund program. The RME, which is defined as the highest exposure that could reasonably be expected to occur for a given exposure pathway at a site, is intended to account for both uncertainty in the contaminant concentration and variability in exposure parameters (e.g., exposure frequency, averaging time). For comparative purposes, Agency guidance (U.S. EPA, *Guidance on Risk Characterization for Risk Managers and Risk Assessors*, February 26, 1992) states that an average estimate of exposure also should be presented in risk assessments. For decision-making purposes in the Superfund program, however, RME is used to estimate risk.[2]

Why use an estimate of the arithmetic mean rather than the geometric mean?

The choice of the arithmetic mean concentration as the appropriate measure for estimating exposure derives from the need to estimate an individual's long-term average exposure. Most Agency health criteria are based on the long-term average daily dose, which is simply the sum of all daily doses divided by the total number of days in the averaging period. This is the definition of an arithmetic mean. The

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1 When acute toxicity is of most concern, a long-term average concentration generally should not be used for risk assessment purposes, as the focus should be to estimate short-term, peak concentrations.

2 For additional information on RME, see RAGS/HHEM Part A and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 55 *Federal Register* 8710, March 8, 1990.

arithmetic mean is appropriate regardless of the pattern of daily exposures over time or the type of statistical distribution that might best describe the sampling data. The geometric mean of a set of sampling results, however, bears no logical connection to the cumulative intake that would result from long-term contact with site contaminants, and it may differ appreciably from — and be much lower than — the arithmetic mean. Although the geometric mean is a convenient parameter for describing central tendencies of lognormal distributions, it is not an appropriate basis for estimating the concentration term used in Superfund exposure assessments. The following simple example may help clarify the difference between the arithmetic and geometric mean when used for an exposure assessment:

> Assume the daily exposure for a trespasser subject to random exposure at a site is 1.0, 0.01, 1.0, 0.01, 1.0, 0.01, 1.0, and 0.01 units/day over an 8-day period. Given these values, the cumulative exposure is simply their summation, or 4.04 units. Dividing this by 8 days of exposure results in an arithmetic mean of 0.505 units/day. This is the value we would want to use in a risk assessment for this individual, not the geometric mean of 0.1 units/day. Viewed another way, multiplication of the geometric mean by the number of days equals 0.8 units, considerably lower than the known cumulative exposure of 4.04 units.

UCL AS AN ESTIMATE OF THE AVERAGE CONCENTRATION

What is a 95 percent UCL?

The 95 percent UCL of a mean is defined as a value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95 percent of the time. Although the 95 percent UCL of the mean provides a conservative estimate of the average (or mean) concentration, it should not be confused with a 95th percentile of site concentration data (as shown in Highlight 2).

Why use the UCL as the average concentration?

Statistical confidence limits are the classical tool for addressing uncertainties of a distribution average. The 95 percent UCL of the arithmetic mean concentration is used as the average concentration because it is not possible to know the true mean. The 95 percent UCL therefore accounts for uncertainties due to limited sampling data at Superfund sites. As sampling data become less limited at a site, uncertainties decrease, the UCL moves closer to the true mean, and exposure evaluations using either the mean or the UCL produce similar results. This concept is illustrated in Highlight 2.

Should a value other than the 95 percent UCL be used for the concentration?

A value other than the 95 percent UCL can be used provided the risk assessor can document that high coverage of the true population mean occurs (i.e., the value equals or exceeds the true population mean with high probability). For exposure areas with limited amounts of data or extreme variability in measured or modeled data, the UCL can be greater than the highest measured or modeled concentration. In these cases, if additional data cannot practicably be obtained, the highest measured or modeled value could be used as the concentration term. Note, however, that the true mean still may be higher than this maximum value (i.e., the 95 percent UCL indicates a higher mean is possible), especially if the most contaminated portion of the site has not been sampled.

CALCULATING THE UCL

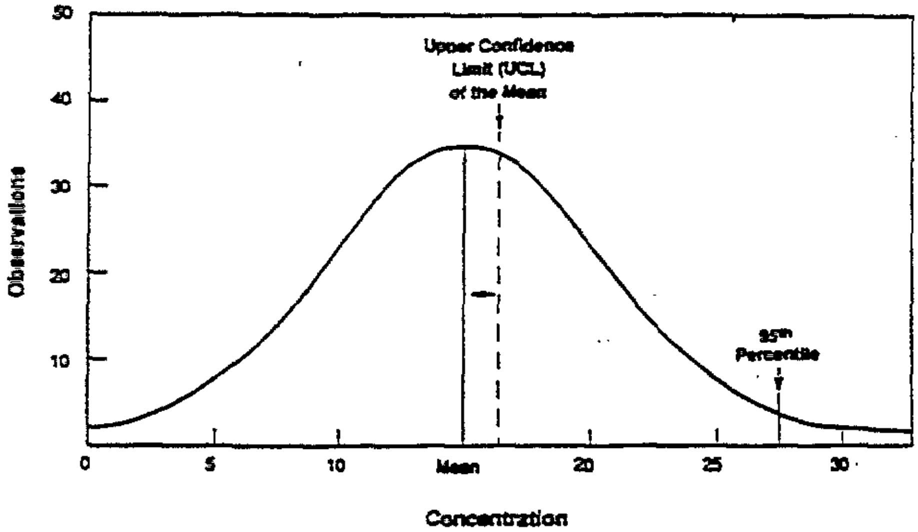
How many samples are necessary to calculate the 95 percent UCL?

Sampling data from Superfund sites have shown that data sets with fewer than 10 samples per exposure area provide poor estimates of the mean concentration (i.e., there is a large difference between the sample mean and the 95 percent UCL), while data sets with 10 to 20 samples per exposure area provide somewhat better estimates of the mean, and data sets with 20 to 30 samples provide fairly consistent estimates of the mean (i.e., the 95 percent UCL is close to the sample mean). Remember that, in general, the UCL approaches the true mean as more samples are included in the calculation.

Should the data be transformed?

EPA's experience shows that most large or "complete" environmental contaminant data sets

Highlight 2
COMPARISON OF UCL AND 95th PERCENTILE



As sample size increases, the UCL of the mean moves closer to the true mean, while the 95th percentile of the distribution remains at the upper end of the distribution.

from soil sampling are lognormally distributed rather than normally distributed (see Highlights 3 and 4 for illustrations of lognormal and normal distributions). In most cases, it is reasonable to assume that Superfund soil sampling data are lognormally distributed. Because transformation is a necessary step in calculating the UCL of the arithmetic mean for a lognormal distribution, the data should be transformed by using the natural logarithm function (i.e., calculate ln(x), where x is the value from the data set). However, in cases where there is a question about the distribution of the data set, a statistical test should be used to identify the best distributional assumption for the data set. The W-test (Gilbert 1987) is one statistical method that can be used to determine if a data set is consistent with a normal or lognormal distribution. In all cases, it is valuable to plot the data to better understand the contaminant distribution at the site.

How do you calculate the UCL for a lognormal distribution?

To calculate the 95 percent UCL of the arithmetic mean for a lognormally distributed data set, first transform the data using the natural logarithm function as discussed previously (i.e., calculate ln(x)). After transforming the data, determine the 95 percent UCL for the data set by completing the following four steps:

(1) Calculate the arithmetic mean of the transformed data (which is also the log of the geometric mean);

(2) Calculate the standard deviation of the transformed data;

(3) Determine the H-statistic (e.g., see Gilbert 1987); and

(4) Calculate the UCL using the equation shown in Highlight 5.

How do you calculate the UCL for a normal distribution?

If a statistical test supports the assumption that the data set is normally distributed, calculate the 95 percent UCL by completing the following four steps:

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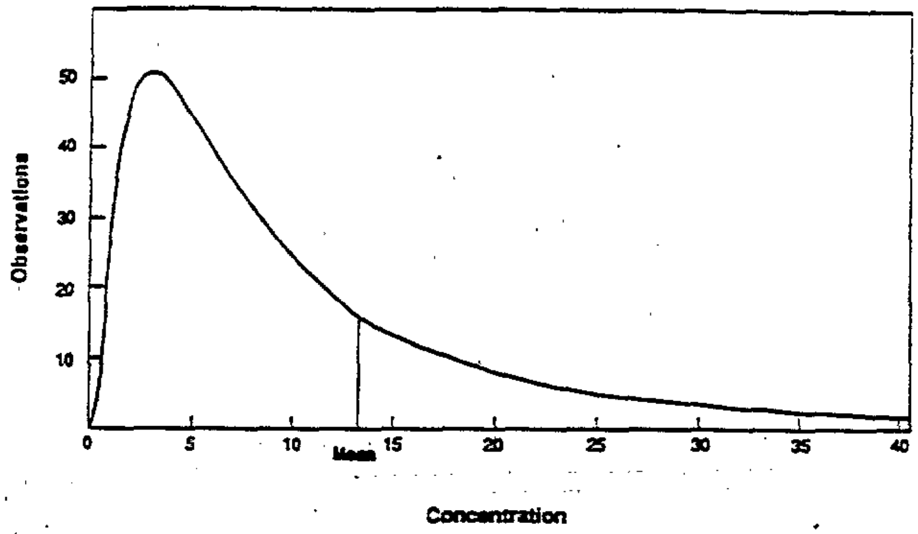
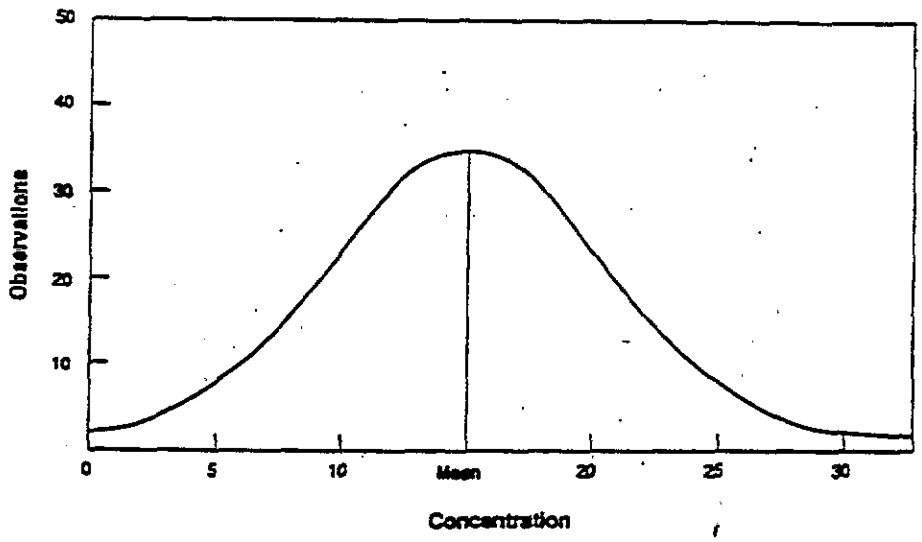
Highlight 3
EXAMPLE OF A LOGNORMAL DISTRIBUTION



Highlight 4
EXAMPLE OF A NORMAL DISTRIBUTION



AR307434

Highlight 5
CALCULATING THE UCL OF THE ARITHMETIC MEAN FOR A LOGNORMAL DISTRIBUTION

$$UCL = e^{(\bar{x} + 0.5s^2 + sH/\sqrt{n-1})}$$

where:

UCL	=	upper confidence limit
e	=	constant (base of the natural log, equal to 2.718)
$\bar{x}$	=	mean of the transformed data
s	=	standard deviation of the transformed data
H	=	H-statistic (e.g., from table published in Gilbert 1987)
n	=	number of samples

Highlight 6
CALCULATING THE UCL OF THE ARITHMETIC MEAN FOR A NORMAL DISTRIBUTION

$$UCL = \bar{x} + t\,(s/\sqrt{n})$$

where:

UCL	=	upper confidence limit
$\bar{x}$	=	mean of the untransformed data
s	=	standard deviation of the untransformed data
t	=	Student-t statistic (e.g., from table published in Gilbert 1987)
n	=	number of samples

(1) Calculate the arithmetic mean of the untransformed data;

(2) Calculate the standard deviation of the untransformed data;

(3) Determine the one-tailed t-statistic (e.g., see Gilbert 1987); and

(4) Calculate the UCL using the equation presented in Highlight 6.

Use caution when applying normal distribution calculations if there is a possibility that heavily contaminated portions of the site have not been adequately sampled. In such cases, a UCL from normal distribution calculations could fall below the true mean, even if a limited data set at a site appears normally distributed.

EXAMPLES

The examples shown in **Highlights 7 and 8** address the exposure scenario where an individual at a Superfund site has equal opportunity to contact soil in any sector of the contaminated area over time. Even though the examples address only soil exposures, the UCL approach is applicable to all exposure pathways. Guidance and examples for other exposure pathways will be presented in forthcoming bulletins.

Highlight 7 presents a simple data set and provides a stepwise demonstration of transforming the data — assuming a lognormal distribution — and calculating the UCL. **Highlight 8** uses the same data set to show the difference between the UCLs that would result from assuming normal and lognormal distribution of the data. These

Highlight 7
EXAMPLE OF DATA TRANSFORMATION AND CALCULATION OF UCL

This example shows the calculation of a 95 percent UCL of the arithmetic mean concentration for chromium in soil at a Superfund site. This example is applicable only to a scenario in which a spatially random exposure pattern is assumed. The concentrations of chromium obtained from random sampling in soil at this site (in mg/kg) are 10, 13, 20, 36, 41, 59, 67, 110, 110, 136, 140, 160, 200, 230, and 1300. Using these data, the following steps are taken to calculate a concentration term for the intake equation:

(1) Plot the data and inspect the graph. (You may need the help of a statistician for this part [as well as other parts] of the calculation of the UCL.) The plot (not shown, but similar to Highlight 3) shows a skew to the right, consistent with a lognormal distribution.

(2) Transform the data by taking the natural log of the values (i.e., determine ln(x)). For this data set, the transformed values are: 2.30, 2.56, 3.00, 3.58, 3.71, 4.08, 4.20, 4.70, 4.70, 4.91, 4.94, 5.08, 5.30, 5.44, and 7.17.

(3) Apply the UCL equation in Highlight 5, where:

$\bar{x} = 4.38$
$s = 1.25$
$H = 3.163$ (based on 95 percent)
$n = 15$

The resulting 95 percent UCL of the arithmetic mean is thus found to equal $e^{(6.218)}$, or 502 mg/kg.

Highlight 8
COMPARING UCLS OF THE ARITHMETIC MEAN ASSUMING DIFFERENT DISTRIBUTIONS

In this example, the data presented in Highlight 7 are used to demonstrate the difference in the UCL that is seen if the normal distribution approach were inappropriately applied to this data set (i.e., if, in this example, a normal distribution is assumed).

ASSUMED DISTRIBUTION:	Normal	Lognormal
TEST STATISTIC:	Student-t	H-statistic
95 PERCENT UCL (mg/kg):	325	502

examples demonstrate the importance of using the correct assumptions.

WHERE CAN I GET MORE HELP?

Additional information on Superfund's policy and approach to calculating the concentration term and estimating exposures at waste sites can be obtained in:

- U.S. EPA, *Risk Assessment Guidance for Superfund: Volume I — Human Health Evaluation Manual (Part A)*, EPA/540/1-89/002, December 1989.
- U.S. EPA, *Guidance for Data Useability in Risk Assessment*, EPA/540/G-90/008 (OSWER Directive 9285.7-05), October 1990.
- U.S. EPA, *Risk Assessment Guidance for Superfund (Part A — Baseline Risk Assessment) Supplemental Guidance/ Standard Exposure Factors*, OSWER Directive 9285.6-03, May 1991.

Useful statistical guidance can be found in many standard textbooks, including:

- Gilbert, R.O., *Statistical Methods for Environmental Pollution Monitoring*, Van Nostrand Reinhold, New York, New York, 1987.

Questions or comments concerning the concentration term can be directed to:

- Toxics Integration Branch
  Office of Emergency and Remedial Response
  401 M Street SW
  Washington, DC 20460
  Phone: 202-260-9486

EPA staff can obtain additional copies of this bulletin by calling EPA's Superfund Document Center at 202-260-9760. Others can obtain copies by contacting NTIS at 703-487-4650.

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RESPONSE

MEMORANDUM

SUBJECT: EPA's Draft Waste Minimization and Combustion Strategy and Its Implications For Superfund

FROM: Elliott P. Laws
Assistant Administrator

TO: Director, Waste Management Division
Regions I, IV, V, VII
Director, Emergency and Remedial Response Division
Region II
Director, Hazardous Waste Management Division
Regions III, VI, VIII, IX
Director, Hazardous Waste Division
Region X
Director, Environmental Services Division
Regions I, VI, VII

PURPOSE

On May 18, 1993, Administrator Carol M. Browner released a Draft Waste Minimization and Combustion Strategy (also referred to as the Draft Strategy) which outlined a series of steps the Agency can undertake to reduce the amount of hazardous waste generated in this country and to ensure the safety and reliability of hazardous waste combustion facilities. This memorandum addresses the relationship between the activities being implemented under the Draft Strategy and ongoing Superfund projects.

BACKGROUND

The Administrator's announcement contained a series of short-and long-term actions to address the issues associated with the combustion of hazardous waste. The short-term actions discussed in the Draft Strategy include:

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- Aggressive use of waste minimization measures as part of permitting, enforcement and other efforts at facilities that generate and treat combustible waste;

- Establishment of management priorities for the Agency's combustion permitting workload over an 18-month period;

- Having a risk assessment conducted at each combustion facility for which a new permit would be issued. This risk assessment would evaluate both direct and indirect exposure pathways;

- Use of omnibus permit authority, as necessary to protect human health and the environment, in permits that are to be issued. Pollutants that might require controls more stringent than those in existing regulations include particulate matter (possibly individual toxic metals), and dioxins and furans (assuming individual facts justify more stringent limits);

- Enhancement of public participation in permitting of combustion facilities; and

- Enhancement of inspection and enforcement efforts regarding compliance with EPA's regulations and with individual facility permit conditions.

OBJECTIVE

Our objective is to continue to implement Superfund remedies involving incineration in a manner consistent with both the Agency's goal of acting expeditiously to protect human health and the environment, and with the intent of the Draft Strategy.

IMPLEMENTATION

The Administrator's announcement clearly indicates that the Draft Strategy is focused towards pollution prevention at its source. With regard to Superfund incineration projects, the Administrator expressly noted that, "...remediation wastes present a different circumstance than newly generated wastes and, given the finite set of options for dealing with historic cleanup sites, combustion may be the most appropriate remedy. In addition, waste minimization opportunities at cleanup sites are usually severely limited." Given this distinction between remediation sites under Superfund and ongoing waste generation at RCRA facilities, the Agency's 18-month shift of permit priorities under RCRA away from new combustion capacity does not mean that incineration should not be considered in assessing Superfund remedies.

In keeping with the spirit of the Administrator's announcement, however, we believe certain provisions of the Draft Strategy may be applicable to Superfund on-site incineration projects. We are providing EPA Regions with the following guidance for determining applicable provisions of the Draft Strategy.

Risk Assessment for Projects Currently Pre-ROD

In order to obtain input from all relevant parties on health issues relating to hazardous waste incineration, we recommend that EPA Regions consult with the Agency for Toxic Substances and Disease Registry (ATSDR) when incineration is a strong candidate for selection as a remedy. ATSDR performed a review of hazardous waste incineration and has had experience with health issues involving incineration at a number of hazardous waste sites. The consultation with ATSDR should occur early on, preferably before developing the proposed remedial action plan.

CERCLA contains a provision that remedial actions must at least attain (or waive) substantive standards set in applicable or relevant and appropriate requirements (ARARs) of other environmental laws. By definition, the Draft Strategy is not an ARAR since it is not itself a legally enforceable Federal or State requirement. See 40 CFR 300.5. However, EPA regards material, such as non-promulgated criteria, advisories, guidance and proposed standards issued by Federal or State governments, as guidance "to be considered" (TBC). See 40 CFR 300.400(g)(3). The Draft Strategy is to be regarded as TBC guidance at sites where a ROD or Action Memorandum has <u>not</u> been signed.

Although compliance with TBCs is not mandatory (as it is for ARARs, absent a waiver), TBCs may be very useful in determining what is protective in selecting Superfund remedies. Therefore, provisions of the Draft Strategy should be treated as TBCs and taken into account when making response action decisions that select incineration subsequent to the date of this memorandum.

EPA Regions should conduct a site-specific risk assessment, including consideration of indirect pathways, to ensure that an incinerator can be operated in a manner protective of human health and the environment. As a first step in the risk assessment process, a screening level risk analysis using highly conservative default values for key exposure parameters and other conservative assumptions may be conducted to determine whether the risk from the given site is below a level of concern. In cases where the risk from such an analysis is above a negligible or de minimis level, an in-depth site-specific risk assessment should be performed. This approach is consistent with the draft implementation guidance of the Office of Solid Waste for performing risk assessments of emissions from facilities burning hazardous wastes.

In a memorandum dated August 11, 1993, the Acting Assistant Administrator provided EPA Regions with clarification of the relationship between the risk assessment and setting appropriate emission levels for particulate matter, dioxin and furans. Among other things, the memorandum emphasized that emission limits for a particular site must be determined on a site-specific basis, based on the result of the site-specific risk assessment and all other relevant factors. The August 11 memorandum, although primarily intended as guidance for regional permit writers, is also applicable to Superfund and should be used by EPA Regions in making decisions on remedial projects.

Further guidance regarding screening level risk analyses and risk assessments is currently being developed and will be available as soon as possible. For an update on these efforts, please have your staff contact Jo Ann Griffith in the Design and Construction Management Branch, Hazardous Site Control Division, at (703) 603-8774.

Risk Assessment for Projects Currently Post-ROD

It is important to note that the Draft Strategy does not question the protectiveness of previous incineration RODs. Nonetheless, in order to retain the highest level of public confidence, EPA Regions should take into account appropriate elements of the Draft Strategy on a site-specific basis for post-ROD projects.

We are currently organizing a technical support group to help EPA Regions make site-specific risk determinations concerning the application of the Draft Strategy to post-ROD projects. The group will be available to consult with EPA Regions on issues, such as conducting screening level risk analyses and risk assessments that include indirect exposure pathways. I strongly encourage regional representation on the technical support group. EPA Regions should identify interested regional staff with appropriate expertise and have them contact John J. Smith, Chief, Design and Construction Management Branch, Hazardous Site Control Division, at (703) 603-8830.

Public Participation and Other Provisions of Draft Strategy

With respect to the enhanced public participation provisions of the Draft Strategy, the Superfund program already advocates early, direct, and meaningful public participation in the cleanup process with much of the emphasis on pre-ROD projects. Superfund Community Involvement staff use a variety of techniques to promote effective public participation throughout the cleanup process, and, especially pre-ROD, these techniques are consistent with the Draft Strategy. EPA Regions should, where appropriate, seek additional opportunities to involve the public in post-ROD projects. For example, EPA Regions may seek public involvement during the planning and operation of trial burns or by holding public meetings to discuss results of risk assessment studies. The goal of these efforts should be to enhance public confidence that Superfund on-site incinerators are capable of burning hazardous waste in a manner that is protective of human health and the environment.

Once a facility begins full-scale operation, EPA Regions should follow Agency policy for conducting RCRA-type inspections of all Superfund on-site incinerators. This policy was distributed to EPA Regions via a memorandum dated December 11, 1991, from the Assistant Administrator to regional Division Directors. Guidance for conducting RCRA-type inspections may be obtained from the Office of Waste Programs Enforcement, which recently distributed an interim guidance for "Performing RCRA Inspections at On-site Superfund Incinerators." See OSWER Directive 9938.06-2a. For a copy of this guidance, contact Denise Ergener, Office of Waste Programs Enforcement, CERCLA Enforcement Division, at (703) 603-9072.

ACTION

Decisions regarding application of the Draft Strategy, particularly those regarding risk assessments, should be made in consultation with Headquarters. As details of the Agency's implementation of the Draft Strategy are developed, we will provide more detailed guidance accordingly. In the interim, questions regarding incineration policy may be directed to John J. Smith, Chief, Design and Construction Management Branch, Hazardous Site Control Division, at (703) 603-8830.

The policies set out in this memorandum are not final Agency action and do not constitute rulemaking, but are intended solely as guidance. They are not intended, nor can they be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided in this memorandum, or to act at variance with the guidance, based on analysis of specific site circumstances. The Agency also reserves the right to change this guidance at any time without public notice.